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CARBOLIC GANGRENE.

GANGRENE PRODUCED BY THE APPLICATION OF DILUTE SOLUTIONS OF CARBOLIC ACID.*

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That dilute solutions of carbolic acid applied to the extremities for a number of hours may produce gangrene and total destruction of the part is a fact of which the public at large and even many physicians are ignorant. It is an unfortunate result of the popularization of the antiseptic treatment of wounds. Carbolic acid, once the favorite antiseptic among surgeons, and now discarded, has become a general household remedy for the treatment of slight wounds and bruises. During the last five years at the Massachusetts General Hospital I have discovered myself, or have seen through the courtesy of the out-patient surgeons, eighteen cases of gangrene from this cause. In a large proportion of these cases amputation has been necessary. These, together with cases which I can find in the medical literature of various countries, make a total of one hundred and thirty-two cases of gangrene from dilute solutions of carbolic acid. It would be safe to assume that many hundreds of fingers have been destroyed from this cause. Doubtless many cases occur and are not recognized as due to carbolic acid, and these with many others are never reported. Usually the patient has come to the hospital with the story of having treated a cut, a bruise, or a felon with a solution of carbolic acid which has been purchased from an apothecary for the purpose. Occasionally the treatment has been suggested by a physician.

* Read at the meeting of the Massachusetts Medical Society, June 12, 1900.

The facts are these: An aqueous solution of carbolic acid (1 to 5 per cent.), if applied to an extremity, as the fingers or toes, for a number of hours in the form of a moist dressing or poultice, may produce gangrene and total destruction of the part. This result is not from compression, but simply from the action of the carbolic acid.

The following history of a case illustrates the occurrence:

The patient came to the out-patient department of the Massachusetts General Hospital. A delicate girl, aged twenty-six years, cut the tip of her right index finger with a piece of tin. Her brother, a strong, healthy man, had treated a cut finger two weeks before with a solution of carbolic acid which he had bought from an apothecary. His cut healed quickly and without trouble of any sort. She adopted the same treatment, washed the finger with the same solution and put on a bandage which she saturated with the carbolic solution. This was 6 P.M. On going to bed she moistened the dressing again with the solution. There was some pain in the finger during the night. In the morning on removing the dressing the skin of the finger was gray in color and the finger felt "lifeless and heavy." It was somewhat swollen throughout and especially at the base. The color changed in a few hours to a dark brown. The discoloration was general, and extended nearly to the base of the finger, this being the limit of the bandage.

A poultice of flaxseed meal was applied. The numbness remained. When the finger was allowed to become dry it looked quite black. Various dressings of a soothing nature were applied.

At the end of four weeks, when I first saw the finger, it appeared to be in a condition of advanced gangrene. (See Plate I.) It was clay-colored in places, dark brown in some, and black in others. The nail appeared bluish-black. A well-marked "line of demarcation" had formed near the end of the first phalanx. The superficial tissues of the remainder of the phalanx were reddened and swollen. The finger was amputated at the middle of the first phalanx. Dr. William F. Whitney made the following report upon the microscopical appearance of this amputated finger:

"A transverse section was made completely through the finger after removal of the bone. This was mounted in celloidin and stained with polychrome methylene-blue and eosin. The skin and subcutaneous tissue stained diffusely with the exception of numerous large colonies of micrococci, which were found in the breaks on the surface and could be followed into the deeper layers. The vessels in this area were thrombosed, and colonies of bacteria were present in the blood-clot. Separating this from the deeper layer was a wide zone of round-cell infiltration, among which polynuclear leucocytes were present in large numbers. In places the tissue was liquefied, and there was a distinct formation of pus. From this to the periosteum there was a diffuse infiltration of round cells, and many of the small vessels were thrombosed, with areas of hemorrhage among the tissues.

"The process may be regarded as a total superficial necrosis with deeper purulent inflammation and hemorrhage." (See Plate II.)

This record is so like the history of other cases observed in the out-patient department of the Massachusetts General Hospital that a report of them would be a needless repetition.

PLATE I.

CARBOLIC GANGRENE.

Appearance of a finger four weeks after the application for twenty-four hours of a dilute solution of carbolic acid. The finger was wrapped in cloths which were saturated with the carbolic solution not stronger than five per cent. Amputation necessary. Inflammatory process at the base of the finger shown by the reddened tissues.

Microscopic appearance shown in Plate II.

PLATE II.

CARBOLIC-ACID NECROSIS. Low power.

A. Area of total necrosis (diffuse red staining) with numerous colonies of micrococci (dark blue).

B. Area of purulent infiltration, diffuse finely granular blue staining from the large number of cells.

C. Area of round-cell infiltration. Fat and fibrous tissue with abundant cells and thrombosed vessels in outer zone.

See Plate I.

The history of the reported cases varies but little. The patient suffers from a wound or pain in the extremity, and by advice, sometimes unhappily, of a physician, sometimes of a friend, and often because of his own idea of the proper treatment of such conditions, he purchases from a pharmacist a solution of carbolic acid. The member is wrapped with a dressing saturated with the solution. If the solution is strong enough and the length of time of its application is long enough the result will be a loss of the part. It is sometimes impossible to determine the exact strength of the solution which has been used. It is safe to assume that it is not stronger than a 5 per cent. solution, since water, which is the common solvent, will take up only about 5 per cent. of the acid. Numerous cases (Lévai [33] and others) have been reported in which 3 per cent. and 2 per cent. solutions have caused gangrene which has resulted in amputation.

Péraire [41] reports a case in a child of ten years, who lost the second and third joints of the finger after twenty-four hours of exposure to a compress saturated with a 1 per cent. solution of carbolic acid. It is therefore plain that any solution of carbolic acid between 1 and 5 per cent. is dangerous. It is needless to add that gangrene does not always follow the use of carbolic solutions in this manner. In the report of the case occurring at the Massachusetts General Hospital, which I have given in detail, I mentioned the fact that the brother of the girl who lost her finger by carbolic gangrene had previously used the same solution in the same manner with no bad effect. The result depends on the strength of the carbolic solution, the manner of application, the length of time of application, and the power of resistance of the individual.

The method of application usually employed is to wrap the finger or the toe in cloth and to saturate this with the solution. Usually, in the cases reported, these wrappings have been kept saturated for from twelve to twenty-four hours. It is probable that the strength of the solution has less to do with the unfortunate result than the length of the application and the thickness of the individual's epidermis. Women made up four-fifths of the cases appearing at the Massachusetts General Hospital.

The destructive effect of pure carbolic acid is generally recognized, and sufferers from the cause are now rarely seen, except as the result of accident. Moreover, the injury from pure carbolic acid is usually less serious than from weak solutions. The action of weak solutions is insidious. The injury is done without causing suffering. Strong carbolic acid, as Lévai [33] has pointed out, forms a scab which resists penetration of the carbolic into the deeper tissues, so that complete gangrene and destruction of an extremity are less likely to follow from the use of liquefied carbolic acid than from weak solutions.

The following experiment was made with the consent of the patient, an elderly woman, whose arm was to be amputated for sarcoma of the elbow:

Aqueous solutions of carbolic acid from 1 to 5 per cent. were applied to the fingers, which had been covered with gauze. The gauze was saturated, each finger with a different strength. Unfortunately for the result of the experiment, the gauze was not kept saturated through the night. When the compresses were removed they were found to be perfectly dry and the skin beneath them entirely unchanged. There was not the least maceration of the skin, nor any apparent difference in the appearance of either finger. Had the compresses been kept moist throughout the night it is probable that a certain amount of gangrene would have resulted. The maceration of the skin which results from the moist application is a very important element in allowing the penetration of carbolic acid. It might be expected that a thick epidermis would withstand the action of carbolic solutions longer than a delicate one.

In 1871 Tillaux[65] reported three cases of carbolic gangrene. In 1877 J. D. Kellock[25] reported two cases in the Canada *Lancet*. Since that time medical writers in various countries have reported cases and called attention to the danger of the use of carbolic solutions. In 1888 M. Kortum[27] thought that the gangrene was produced by the action of the carbolic acid upon the trophic and vascular nerves of the part. In 1890 Frankenburger,[14] by experiments upon animals, proved that dilute solutions of carbolic acid would produce complete destruction of the parts to which they were applied.

As a result of microscopical study of the tissues he concluded that the carbolic acid acted directly upon the red and white corpuscles of the blood, producing stasis and thrombosis, thereby preventing all nutrition, and that this condition produced death in the parts. He thought that the effect upon the nerves was of minor importance.

In 1896 Josef Lévai[34] reported twelve cases of carbolic gangrene, the result of dilute solutions, observed by himself, and mentions fourteen other cases which he had seen resulting from strong carbolic acid. He collected reports of forty-two cases of carbolic gangrene. His observations led him to doubt the theories of Kortum[27] and of Frankenburger,[13] that the gangrene was produced by the peculiar action of carbolic acid upon the nerves or upon the bloodvessels. By a series of careful experiments he shows that the death of the part is due to a direct chemical action on all parts of the tissues. He shows that carbolic acid has no specific quality for the production of gangrene, but that other diluted chemicals might produce the same effect. Five per cent. solutions of muriatic acid, nitric acid, sulphuric acid, acetic acid, and of caustic potash produced gangrene as well as carbolic acid when applied to an extremity by a moistened compress for twenty to twenty-four hours.

PLATE III.

FIG. 1. Thumb after the use of a dilute solution of carbolic acid. Amputation necessary. Thumb was scored in the attempt to save it. Case of Dr. C. L. Scudder.

FIG. 2 Appearance of finger of a young woman twenty-five days after the use of a dilute solution of carbolic acid.

FIG. 3. Appearance of a finger twenty-seven days after treatment with a dilute solution of carbolic acid for a crush of the last phalanx. The solution had been purchased from an apothecary who said it was five per cent. Amputation at the end of the first phalanx. Case of Dr. C. A. Porter.

FIG. 4. Result of the use of a weak carbolic-acid solution for a felon. After a number of weeks the last phalanx dropped off, leaving the above appearance. Case of Dr. Scudder.

FIG. 5. Finger after the use of dilute solution of carbolic acid for slight injury. Amputation necessary at line of demarcation.

FIG. 6. Same as Fig. 2 after amputation.

FIG. 7. Appearance of finger three weeks after the use of a weak solution of carbolic acid for paronychia. Amputation necessary.

"The histological examination shows that in the beginning each of the diluted chemicals applied in the form of a moist dressing produces the same effect: the epithelial layer becomes œdematous and loosened." "As soon as a way has been made to the deeper layers each agent produces in a different way the same result, namely, necrosis of the living tissues." The death of the part takes place in layers downward, and affects not only the nerves and vessels, but all the tissues at the same time. Maceration of the skin having taken place, as a result of prolonged action of the watery solution, the penetration of the chemical becomes easy and rapid.

Experiments and observations show that the gangrene does not result primarily from tight bandages, although tight bandaging undoubtedly increases the tendency to this process. The gangrene is limited to the parts enveloped by the moist compress, for in some cases, as mentioned by Lévai,[33] the last phalanx of the finger when not covered by the dressing has escaped and may continue to have its natural appearance and to bleed when pricked for some time, when the finger nearer the trunk may be quite black and without sensation. The gangrenous process may sometimes be so slight that only the skin is destroyed. Dr. C. A. Porter was able in such a case to save in part the usefulness of a finger by skin grafting before cicatrization took place. The treatment of this condition must vary according to severity of the process. In many cases it soon becomes evident that amputation will be the only helpful treatment. If the process seems superficial and the case is seen soon after the removal of the carbolic dressing it might be beneficial to apply a dressing saturated with a bland alkaline solution such as lime-water.

It has been asked why gangrene does not occur upon the trunk. Superficial gangrene does occur if the application is sufficiently prolonged and the saturation of dressings is great enough. The result is not so disastrous because of the greater thickness of tissues and because the blood-supply cannot be shut off as it is in an extremity. It is the enveloping of the entire part, as a finger or toe, with the dressing which causes the complete destruction of the part, since the gangrene only affects those parts which are thus covered.

The public must be taught to use some safer treatment. Moist dressings are often very soothing and helpful in slight injuries of the fingers or toes. A large part of the benefit to be derived from any form of moist dressing can be obtained by using boiled water on clean compresses. Safe household remedies for this purpose are tincture of hamamelis or solutions of borax or of boric acid.

It is evident that carbolic acid solutions in any strength applied as a moist dressing is dangerous and ought never to be used. The fact that it is often used without bad results renders it the more dangerous. It

is the duty of the medical profession to see that this needless destruction of fingers is stopped. Carbolic acid of any strength should be included in the list of those drugs which can only be procured by a physician's prescription. Whatever the strength, it should always be labelled as dangerous.

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REPORT OF THE COMMITTEE OF THE AMERICAN SURGICAL ASSOCIATION ON THE MEDICO-LEGAL RELATIONS OF THE X-RAYS.[1]

GENTLEMEN: At the meeting in 1897, in a paper on the "Röntgen Rays in Surgery," the chairman of this committee made the following remarks:

"Before leaving the subject of fractures it may be well to present for discussion a few questions having a medico-legal bearing, even although it may not be possible at present to answer them finally.

"We may begin by asking whether skiagraphy has as yet given us a better understanding of fractures in general or has been the means of suggesting more efficient treatment.

"It is difficult, in reply, to point to any one definite addition to our knowledge of these injuries, and so far as I know no material modification of the general rules governing the treatment either of fractures generally or of any specific fracture has as yet resulted; but in individual cases, such as have been described above, it has certainly been of great utility, and is likely to become more valuable as technique improves and experience increases.

"The question whether or not the patient has the right to demand, as ordinary care, that the medical attendant should have a skiagraph of the fracture taken, I would at this time unhesitatingly answer in the negative. Until a much larger number of cases have been observed, and the pictures and the clinical results have been compared, the routine use of skiagraphy might be more harmful than useful.

[1] Read by the Chairman of the Committee, Dr. J. William White, of Philadelphia, at the meeting, May, 1900.

"There can be no doubt, however, that skiagraphs will figure largely in suits for damages after accidents and in cases of alleged malpractice. They have already been admitted as evidence in such cases, and it is probable that juries will with increasing frequency have to decide whether to place greater weight on deformity as shown by skiagraphs or on expert evidence as to the absence of genuine disability. It seems obvious that each case must be studied by itself, but that it would be injudicious, if not altogether unwarranted, for us to assume at present that clinical experience and the judgment based upon it should be subordinated to the pictorial testimony of the skiagraph.

"It is not, however, too soon to advise that in all obscure, complicated, and unusually difficult cases the help afforded by the Röntgen rays shall be secured by the surgeon, even if it is done chiefly with a view to his own protection.

"As time goes on it is probable that we shall be better able to estimate accurately the precise clinical value of minor deformities. In the meantime it seems to me we should be careful to avoid the setting up of an impossible ideal as a standard in fracture cases."

In the discussion that followed Dr. Fowler said: "With regard to malpractice suits, a lady recently came to me with a skiagraph of a part of her forearm, wrist, and hand, showing apparently a most deplorable deformity as the result of a Colles' fracture. The picture had been taken for her at one of the X-ray studios conducted by a lay combination of electrician and photographer. She considered the case one of gross malpractice, and threatened suit against the practitioner who had treated it. In reality the deformity was nothing like as great as the picture showed. I found that I could put her well arm in such a position with relation to the plate as to produce a greater deformity than that which it was claimed existed in the injured arm. I was also able to place the hand that was deformed in such a position that the bones appeared almost normal in the picture. These X-ray suits are likely to become sources of annoyance and even financial loss to surgeons. Personal damage lawyers will enter into collusion with those in charge of the X-ray studios, and patients who from curiosity or other motives apply for skiagraphs of fractures will be encouraged to institute legal proceedings to recover damages for alleged improper treatment."

Dr. Richardson said: "I have talked the medico-legal side of this question over with several of our judges, and some of them are going to admit these skiagraphs. The important point is how you can tell that the skiagraphs are accurate, and this is a very difficult matter. In many cases it will be absolutely impossible for us to say that there is no fracture. I could not detect any in one case, but there was one. We could not bring up a more important subject at this time, and the question is as to the position the surgeon should assume when he meets with fractures

and dislocations. A great deal of trouble is going to result from these pictures. If it is true that they are not accurate, and that fractures are shown when none exist, then they cannot be relied upon in diagnosis."

Dr. Weist then made the suggestion that a committee be appointed "to formulate an opinion as to the reliability of skiagraphs," and the result was the formation of this committee on "The Medico-legal Relations of the X-rays."

Since then I have written annually to all the members of this Association, asking that they aid the committee in securing definite evidence as to the reliability—or more especially the unreliability—of X-ray pictures in various forms of disease or injury.

In February, 1899, the following circular letter was sent to every member of the Association:

DEAR DOCTOR: I am chairman of the committee appointed in 1897 to report to the American Surgical Association upon the medico-legal value of the X-rays. In the printed report of the minutes of the nineteenth meeting, held in April, 1898, page 343, will be found a provisional communication asking particularly that all Fellows of the Association would have the kindness to send our committee any examples of cases of X-ray examinations which have been deceptive or misleading as to their practical value. We have had absolutely no response to this request. We venture, therefore, to ask you directly if you can help us in securing material upon which to base a report which may at least be the subject for discussion.

We should be glad if you would answer categorically the following questions:

1. Have you found skiagraphy reliable in the diagnosis of (*a*) fractures attended with so much swelling of surrounding tissues that satisfactory palpation of the fragments is impossible? (*b*) Fractures about joints? (*c*) Epiphyseal separations? (*d*) Fracture of the neck of the femur? (*e*) Ununited fractures? If in any of the cases belonging to one or the other of these classes the skiagraph was misleading, we would like particularly to have a print of it and the clinical history of the case.

2. Have you any reliable cases of recognition of (*a*) fracture of the base of the skull? (*b*) Fracture or dislocation of the vertebræ? (*c*) Fracture of the sternum, scapula, clavicle, or pelvis?

3. Do you know of any cases in which the testimony of the skiagraph in cases of supposed foreign bodies in tissues, or of tumors, gallstones, or kidney stones, has led to ineffective or mistaken operations?

There is much collateral evidence which could be asked for, but which it is the hope of the committee will be developed during the discussion. The immediate object of the committee is to determine if possible to what extent the testimony of the skiagraph may be relied upon either as a basis for treatment (especially in fractures) or as evidence for or against practitioners in suits for malpractice. As we are trying to do this work in the interest of the profession generally, we hope that you will aid us as far as possible. Yours very truly,

J. WILLIAM WHITE,
Chairman.

The replies to question No. 1 were uniformly in the affirmative, except as to item (*d*), which refers to the neck of the femur. As to that, with but one exception, the replies were negative.

As to question No. 2, they are almost as uniformly in the negative.

Question No. 3 was answered negatively by twelve and affirmatively by six.

In other words, the large majority of the surgeons who replied at all to the communication had found the skiagraph satisfactory in fractures with great swelling, fractures about joints, epiphyseal separations and ununited fractures, but not in fractures of the femoral neck. The same number had not had reliable pictures of fractures of the base of the skull, of the spine, of the pelvis, sternum, or scapula. A few had used it in cases of fracture of the clavicle, but there it is obviously rarely necessary.

The answers to the third question vary, as during the time of the correspondence rapid improvement was made in the technique, and renal calculus became fairly easily recognizable; of course, it was not likely that many cases of mistakes as to supposed foreign bodies in the tissue would occur, but the cases recorded later serve as a warning as to the possibility of such mistakes.

The material procured in this way did not yet appear to justify definite conclusions, and at the meeting last year the following report was presented:

The Committee on the Medico-legal Relations of the X-rays begs to report progress, and respectfully asks to be continued. The committee feels that the position taken finally on this question by this Association should rest upon the broadest possible foundation. The evidence now available is insufficient for the purpose of drawing general conclusions which may serve as a safe guide to both the medical and legal professions in appropriate cases. While the value of the X-rays in surgery and even in medicine is obviously increasing, it is equally apparent that with their more extended use the opportunities for misinterpretation are also multiplying. It is most important that we should be able to state and to illustrate at least the most common examples of conditions under which the evidence offered by the X-rays may be unreliable.

The committee once more begs the members of the Association to aid it by supplying carefully observed and recorded personal cases with negatives or prints, and by calling attention to any others that may be useful in this relation.

Since then, with one or two exceptions, no communication has been received from any member of the Association. These prefatory remarks seem necessary, because the matter still appears to the chairman of your committee to be one that may at any time become acutely and vitally important to any practising surgeon; because so far as he knows this will be the first body of prominence to take formal action on the subject; and because such action should be so well considered and well

grounded as to serve as a guide to both the legal and the medical professions in the immediate future.

In fairness to skiagraphy itself as a surgical aid, it should be stated in advance that many of the errors of which examples are cited in this report are avoidable; that the habit of taking more than one plate and of comparing with plates from the normal region corresponding will lessen them when it is systematically adopted; and that there is no disposition on the part of the committee to deny or disparage the great usefulness of skiagraphs in surgery.

But usefulness and infallibility are not identical. In a thing which purports to be a representation analogous to a photograph, showing only what exists and nothing else, the claim of infallibility, of exact accuracy, is sure to be made by some lawyers and listened to approvingly by some judges and juries. Your committee believes that the time for such an attitude has not arrived, and that the facts now before the profession, some of which are herewith presented, justify this conclusion.

In trying to systematize the material bearing on this subject it has seemed well to classify the evidence, which goes to show:

1. That there have already been cases of improper use of the skiagraph in court.

2. That there is real danger for the future from the teaching of some of the profession who have not preserved a judicial mental attitude, but have been led by the many and undoubted advantages of skiagraphy to exalt it beyond its present merits.

3. That important mistakes have been made in reference to (*a*) fractures, (*b*) foreign bodies, (*c*) renal calculi.

4. That suits for damages on account of X-ray burns and their consequences are now occurring, and that surgeons may suffer thereby even if not the actual skiagraphers.

5. That to counterbalance the extremists, many of the profession have individually called attention to the fallacies of skiagraphers and to the danger of their use as medico-legal evidence.

1. As to the first question, it is scarcely necessary for the committee to spend much time in proving that the dangers of the improper use of the skiagraph in medico-legal cases is not imaginary, but a few illustrative cases may be cited.

In a case in Providence, R. I., the testimony of the skiagrapher was accepted by the court as final and conclusive evidence that a Colles' and a Barton's fracture had existed in the case of the plaintiff. The suit was therefore dismissed.

The *American X-ray Journal*, May, 1899, comments editorially upon the case as follows:

"If the physician understands anatomy and radiography very well he can at will distort a normal joint in a picture, or favorably present

the condition of an injured one. The normal divergence of the X-rays, which is constant always to some degree, makes the picture untrue. The distortion by position can be of almost any degree, and with an operator who is an expert we must rely on his oath. If he is not an expert his testimony is faulty. It was not shown in this case that any means were taken to obtain parallelism of the X-rays.

"It is now history that if provisional callus in considerable amount remains about a fracture, then X-rays will show on the screen and on the sensitized plate a line between the fragments. The distortion by position and also the normal distortion should have been corrected with impervious devices, and these shadows should appear in the picture in order that the judge and jury might have the truth understandingly. Certainly, from the report of the case as it comes to us, we cannot resist the feeling that the evidence was insufficient to prove a Colles' fracture and lacking in X-ray expert testimony sufficient to disprove a Barton's fracture."

In Bangor, Maine, in a suit for $4000 damages, it appeared that the physician in attendance had failed to reduce a backward dislocation of the forearm. His diagnosis was that the patient had a fracture of the olecranon, and fracture of both condyles, with dislocation. Three physicians, after skiagraphic examination, testified that there had been no fracture of either olecranon or condyles, but that there was a backward dislocation, which they had successfully reduced.

The *American X-ray Journal*, May, 1899, says editorially:

"This appears to be one of those trying cases in which the 'old way' causes the doctor to grope in darkness, feeling content that his faults cannot be uncovered. The X-rays used in this case would have saved the woman physical pain and the doctor mental anguish.

"Justice T. H. Haskell admitted the X-ray picture in evidence. No objections were filed. He admitted the bared arm to be witnessed by the jury. Objection filed by Attorney Carleton for the defendant. He would not permit medical text-books to be read and used as evidence.

"The legal ruling in this case was certainly in line with the intelligent opinions of judges in higher courts.

"The X-ray picture was the principal factor in the plaintiff's case, for it told the true condition of the arm at the close of the defendant's treatment. This put the defendant to an excuse of his treatment resulting so disastrously."

The jury found a verdict for the plaintiff.

Dr. S. H. Weeks (personal communication) thus summarizes this case:

"The jury at Bangor, Maine, in the malpractice suit of James *vs.* Weld, after being out more than six hours, brought in a verdict for $500 for the plaintiff. The cause of action was the alleged unskilful treatment of a dislocated elbow-joint by Dr. ———, of Oldtown, the

complainant being a young lady music teacher of that city. The trial has occupied three days, during which time some of the most notable medical experts of Eastern Maine were called to testify. For the first time in the history of Maine court practice X-ray pictures were introduced as evidence in behalf of the plaintiff.

"As regards fracture of the neck of the femur, an interesting malpractice suit occurred in this city, directed against Dr. ———, a capable surgeon of excellent standing. A young man fell from a height and injured his hip. He was able to stand on it with difficulty. There were no shortening, no eversion, that were noticeable; no other evident symptoms of fracture. Diagnosis and treatment that of contusion. Patient failed to return as directed for further observation. In the course of a number of months instigated suit. Was examined by three physicians and perhaps two inches of shortening with eversion discovered. Inability to use limb. Defence was that disease had supervened—tubercular, or arthritis deformans, or simple absorption. Skiagraph taken. The skiagraph was not satisfactory. It showed shortening and irregularity of the neck, but it was impossible to say whether these were due to injury or disease. A projection upward from the neck was claimed by the prosecution as being a splinter. The defence contended that a splinter would have been absorbed or at least rounded off, while this was sharp, and claimed that the apparent projection was merely a shadow due to the angle at which the picture was taken. As far as proof went the skiagraph was useless."—(Personal communication, Dr. Leonard Freeman.)

Dr. E. H. Bradford writes me as follows:

"I have not known of any case of testimony of the skiagraph which has led to ineffective or mistaken operation. I have known of a case of suit for malpractice which was threatened, from a faulty interpretation, by a lawyer, of a skiagraphic tracing, considering that the shadow of the fibula indicated a split in the tibia."

2. As to the danger which threatens from the unqualified statements of some authors the evidence is abundant. When a medical writer, after describing the usual methods of diagnosis in case of fracture, goes on to make such statements as the following, it is certainly time that the position taken was either indorsed or repudiated by this Association. After detailing the time-honored methods used in the diagnosis of fractures, he says:

"With the employment of all these means, fractures have often failed to be correctly diagnosticated even by the greatest surgical masters of all countries. The courts can show endless histories of grave errors committed, to the detriment of poor patients and not the less of poor practitioners; but the discovery of Wilhelm Conrad Röntgen has come to do away with all this. At present there are no fractures the

character of which cannot be established beyond a doubt; but much more has been shown to us by these rays. A glance at the fluoroscope not only gives one an idea of the special type of the fracture, but the situation, shape, and the number of the fragments and their correlation can be clearly ascertained. The photographic plate fixes the details of the fracture exactly, and permits of the thorough study of the various features of the fracture type. Its comparison with the normal skeleton makes the abnormalities evident at once, so the use of anæsthetics, which in many cases are not at all advantageous for the patient's physical condition, is no longer required in diagnosis. It is clearly seen that the advent of the Röntgen rays has accomplished no less than a revolution in the understanding of fractures."

In dealing with special fractures, he says in regard to impacted fractures of the neck of the femur that it may resemble contusion, and adds: "In such cases elucidation by the Röntgen rays is urgently required;" but makes no mention of the general unsatisfactory character of skiagraphs of this region. It is noteworthy that in regard to this particular fracture fifteen Fellows of this Association out of those who replied to that question in the circular letter stated that they had not used the process in cases involving the neck of the femur. There is a good reason for this, of course. The information derived from a good skiagraphic picture, properly interpreted, would unquestionably be of great value in many cases. But the difficulties are very great. Mr. Muirhead Little (*British Medical Journal*, May 20, 1899) says:

"In no part of the body are mistakes more likely to be made than in considering skiagraphs of the pelvis and hips. At the Congress of the German Society of Surgery at Berlin in April, 1898, Hofmeister showed a number of skiagraphs of one normal pelvis from various points of view which gave various false appearances of deformity of the pelvis and femurs."

Mr. Little then figures in an extremely instructive illustration the varying forms of the images that can be produced of the head and neck of the normal femur by various relative positions of focus, tube, skeleton, and plate, showing at a glance that many deformities can be imitated and that the angle of the femoral neck, its thickness, its outlines, the size and relations of the condyles, the size and shape of the head of the bone, can all be made to vary so that coxa vara, osteo-arthritis, union after fracture with deformity, can easily be simulated. In the paper above mentioned, Hofmeister stated that the angle of the neck with the shaft of the normal femur might be made to appear as small as 90° by alterations of the relative positions of light, plate, and skeleton.

Infinitely more work must evidently be done before the diagnosis of injury and disease in this region can rest surely and safely on skiagraphy.

In reply to one of the questions in the circular letter seventeen Fellows

said that they had had no reliable cases of fracture or dislocation of the vertebræ.

Yet the writer already quoted from, writing on fractures of the spine, says that "with the aid of the Röntgen rays the type of the fracture and the size and number of the splinters and their location can be so well represented that the indications for the mode of treatment are set forth clearly. If there is only slight angular displacement reduction can nearly always be accomplished; but in the event of intraspinal hemorrhage, and when bone fragments, driven into the canal, press upon the cord, operative interference is required."

He also says that "under the application of the Röntgen rays the results of operation, which formerly had been confined to exploration, became much more encouraging. The field of operation being outlined by the skiagraph, the *modus operandi* could be determined before operation. While at one time it was deemed advisable to expose a large portion of the spinal column in order to ascertain that every possible injury had really been reached, now all the operative procedures can be carried out under the indication of the rays with ease and security, even the length of the incision necessary for the removal of bone-splinters being shown by the skiagraph."

In an otherwise excellent chapter on the "Röntgen Ray in Relation to Fractures," contributed by Dr. E. A. Codman to Dr. Scudder's admirable work on the *Treatment of Fractures*, the former says: "A diagnosis of fracture without skiagraphs is always open to doubt, while with a careful X-ray examination there is seldom a doubt." He concludes, however, by saying:

"This chapter has been mainly devoted to warnings of the dangers of the Röntgen rays, and may in a measure discourage practitioners from its use. It should be stated, however, that when the limits of error are kept clearly in mind the actual value of the discovery to surgical science is very great. When there is doubt of the detailed diagnosis of a fracture no physician has done his full duty by his patient if he can command skiagraphic examination and has not used it. This is particularly true in medico-legal cases where there is a question of liability."

Similar evidence of the disposition to rest implicitly upon supposititious X-ray evidence is easily obtainable.

Dr. J. B. Roberts writes:

"Attention is called to the danger of relying too absolutely upon the appearances in skiagraphs, because of a recent article in a medical journal published in an important medical centre of the United States. A professor of surgery in one of the medical schools of that city makes the unexpected statement that in forty-four cases of fracture of the lower end of the radius which were skiagraphed nineteen showed that 'a distinct transverse fissure above the capitulum ulnæ existed without caus-

ing any apparent symptoms.' He then proves his assertion by printing several skiagraphic pictures of the lower end of the forearm which show a white line running more or less transversely across the lower end of the ulna. In one case, he says, five days after the injury, the patient was shown to an audience of about one hundred physicians. No one of these was able to recognize the ulnar fracture by examination of the patient, in whom there was, according to the author, no visible deformity at the seat of the ulnar fracture. It is curious that neither the professor himself nor his one hundred colleagues recognized the supposed line of fracture as the unossified epiphyseal cartilage normally present in children and young adults. This criticism is made because the unfortunate error of the author may lead to erroneous deductions and conclusions on the part of those who read his article."

Dr. F. W. Ross, acting assistant surgeon, U. S. A., says (*American X-ray Journal*, January, 1899):

"While the use of the X-ray is of inestimable value to us in making diagnoses, it is not an unmixed personal good, as we well know from actual experience.

"If it increases our diagnostic ability it also increases our responsibilities, and we are more exposed to suits for malpractice in fractures, particularly if deformity exists and we have not used it as a means of diagnosis, also in dressing and examination after reduction. I use it in all cases of fracture after splints and bandages are adjusted. *Negligence will be claimed for failure to use it in all cases where bad results follow.* If we have used this means we are strongly fortified."

Dr. A. V. L. Brokaw makes the following remarks on "The X-ray Diagnosis in Children:"

"The text-books of surgery and anatomy will necessarily, in part, require to be rewritten, owing to the revelations at variance with past teaching and ideas. The excuse that the conditions in a fracture-dislocation about the elbow cannot be determined, by reason of great swelling of the soft parts, will not in the future prevail. An examination with the fluoroscope, or the positive evidence of a radiogram, will establish with certainty the conditions present and enable the attendant to make a prognosis as to the future of the joint, thereby protecting in a measure the attendant from the all too frequent suits."

The *American X-ray Journal*, February, 1899, says, apropos of the necessary distortion seen in X-ray pictures, that unless this distortion is corrected the skiagraph is not true, and is therefore dangerous evidence to the operator, and also in courts of law; but it adds, however: "The Dennis fluorometer will correct these distortions with mathematical accuracy. No operator can conscientiously do surgery without this evidence, and the time is not far distant when this knowledge in medico-legal cases will be put to the severest test."

In the same number an ordinary case of fracture of the femur is figured, there being some overlapping, amounting, it is said, to about an inch. After complimenting the "eminent radiographer" who took the picture, publishing his portrait, and mentioning the fact that he is called upon far and wide for assistance, it adds that the case "is an able argument in favor of the universal use of the X-ray in fractures. Certainly no surgeon can be safe in setting fractures or dislocations without the aid of the human eye looking directly upon the site of injury."

3. (*a*) The members of this Association write as follows regarding the general subject of the value of the X-rays in fractures:

"My experience in fractures has been too limited to pass judgment. Unfortunately in the case that I found especially obscure, the ray only suggested a solution without clearly defining the difficulty. This I was obliged to lay to the charge of the artist and not to the ray. Thus far I have not derived material benefit from its use in fractures, as my ability to determine the condition without its help had more weight than the obscure shadow picture."—Oscar H. Allis.

"I believe the X-ray as a witness in suits does mislead. I saw a picture of Colles' fracture—a second break—which was misleading."—David W. Cheever.

"I cannot say that I have derived great assistance (diagnostic) in the cases included in question. I have found that the clinical result was in some cases far better than the position of the bones as shown by the X-ray picture would lead one to expect. My examinations of the pelvis and vertebræ have shown little, for the pictures have been too indistinct."—H. W. Cushing.

"One of the strikingly misleading features of a skiagraph is the apparent compared with the positive results as to deformation in deformities of the ankle-joint. Given a case of fracture near the ankle-joint, with marked deformity, which is corrected under an anæsthetic and by operation, if necessary, frequently the skiagraph, which is supposed to record the end result, will give a marked amount of deformity which is entirely misleading as to the functional result."—Herbert L. Burrell.

"It is probable that in not a few cases in which an excellent functional result is obtained the bones are not in an ideally perfect apposition. A fracture may even exist without the X-rays showing the slightest evidence of it. In a case of osteotomy performed by Dr. W. J. Taylor and skiagraphed through the dressings and a woollen splint the day after operation, no evidence whatever was shown of a fracture which was known to be absolutely complete and only one day old. Such a case should make us very careful in giving too positive testimony even from skiagraphs."—W. W. Keen.

"In answer to your first question I can only say that in general I have

found skiagraphy valuable in giving me a clearer understanding of some cases of fractures, as, for example, in cases where deformity, perhaps not carefully enough looked for, was shown. I have, however, also found at times that the deformity, which I felt sure by other means of examination existed, did not seem to be very markedly exhibited by the skiagraphic picture. This was probably due to the skiagraph not being taken in the line to best show the deformity.

"I recall, however, one case of supposed dislocation of the femur which the skiagraph proved to me to be a fracture; the evidence of the skiagraph was very valuable, as it prevented unnecessary attempts to take reduction.

"In some cases of ununited fracture the information given has been satisfactory, although I recall one case where union took place in which the skiagraphic picture seemed to give evidence that the separation was too great to allow such a result.

"In reply to question 2, I can only say that I remember seeing a skiagraph in the hands of a friend which proved the existence of an unexpected fracture of the pelvis."—J. B. Roberts.

"(*a*) Have no experience in this class of cases. (*b*) I have had at least three examples in my practice of deceptive skiagraphs of fractures. 1. Fracture of os calcis with perfectly well-defined crepitus and motion between the two fragments. The skiagraph failed to show any clearly recognizable fracture, although the print was clear and of good definition. 2. Failure to show a perfectly well-marked fracture of the patella with considerable separation of the fragments. 3. Fracture of distal end of radius in which two pictures placed the fracture at different points and showed marked variation of direction and extent of it."—F. S. Watson.

The following additional evidence may be cited:

Dr. Carl Beck (*New York Medical Journal*, January 6, 1900) reports the case of a boy, four years of age, who, while playing on the street, fell against an iron bar. "Being unable to rise again, he was taken up and carried to St. Mark's Hospital, where in the first instance moderate pain was noticed besides the functional disturbance in the left leg. There was neither any difference in level nor any deformity, nor any shortening, nor the typical equinus position. As shown from a photograph taken two days after the injury, there was only a very moderate and uniform swelling of the leg. Abnormal mobility and crepitus could be produced only by very rough manipulations. On the day following the injury two skiagraphs were made in different positions: one of them in the dorsal and the other in the lateral position. To my surprise, a skiagram made by direct irradiation, the centre of the platinum disk of the tube being perpendicular to the anterior surface of the leg, did not show the slightest indication of a fracture, while the

other, which represents the leg irradiated from the lateral outer aspect of the tibia, showed a marked fracture line. A third irradiation made on the fifth day after the injury, in the same position as in the dorsal skiagram, also showed the presence of a fracture beyond doubt. The patient was discharged, cured, five weeks after the injury."

Dr. W. J. Dodd, of Massachusetts General Hospital, writes me: "Of course, as you well know, we cannot overlook the fact that sometimes there is so little displacement that the skiagraph does not show fracture. We have had several cases where the surgeon made out fracture, yet the skiagraph did not show it; this was not because of poor plates, but because there was no displacement, and it was necessary to make deformity by rotation or force in order to make it apparent on the screen or plate, or else take the plate in different positions. I state this simply to show that oftentimes more can be ascertained by manipulation than by one plate. In such cases I think fluoroscopic examination is oftentimes more satisfactory, except, of course, in dense parts of the body. In fractures about joints the results have been very satisfactory, except about elbow-joints, where oftentimes it is so difficult to get an arm in suitable position. I think we have had more difficulty and less satisfaction with the elbow than with any other joint.

"We have had seven cases showing fracture of the neck of the femur, three of these were not recognized as such. Of course it is somewhat difficult to get a very sharp skiagram of that part of the body, still in all seven cases we succeeded in getting fair plates, sufficiently clear to enable the surgeon to make out fracture. Two of these were impacted. Impaction was not demonstrated clinically."

Dr. Harvey Reed reports and figures (*Journal of the American Medical Association*, April 30, 1898) a case in which an extraordinary degree of deformity in the bones and the leg is shown and is contrasted with a very satisfactory clinical recovery. He adds: "If this radiograph should be taken into court and submitted to a jury without taking into consideration the facts in the case, it would certainly by very misleading and would indicate a much worse condition of the limb than the clinical facts in the case would warrant. This shows seven distinct fractures of the bone, and yet with all that we have only two inches more shortening than existed in a previous fracture of the same limb.

"In another case there was a fracture of the tibia at about the middle of the lower third, and a fracture of the fibula at the upper part of the upper third, with a sliver of bone broken off the tibia at or near the point of fracture. This sliver could be freely moved up or down, and though the radiograph fails to show its presence, it undoubtedly existed, and notwithstanding we had two oblique fractures this patient got well with less than an inch of shortening, but if we were guided by this skiagraph we might think that the adjustment of these bones

was not as perfect as it might have been, and that there was a deformity of considerable magnitude. On the contrary, the man was young and healthy, with no injury of the soft parts, and we were enabled to put on extension and counter-extension, which was followed by a plaster-of-Paris cast after the œdema had subsided, and almost a perfect result was obtained as far as the clinical features of the case were corcerned."

In the discussion which followed Dr. Reed's paper, Dr. Grant, of Denver, remarked that "unless the surgeon in treating a patient in a case of malpractice can show that he has treated him in accordance with that experience which is embodied in the ordinary text-books of his profession, and the patient is dissatisfied, he is liable in pecuniary damages to his patient. If he should accept the teaching of the X-ray in any case, and his results were not satisfactory, he would be liable for damages. The X-ray can be made a dangerous instrument as well as an aid to the surgeon, and if the profession treats it as it usually does everything new it will prove an instrument of danger. It will be an expensive thing for the surgeon."

(*b*) As to foreign bodies, the members of the Association have written as follows:

"In one case of supposed headless pin in the œsophagus a defective plate was rather deceptive. There was a scratch on the glass under the gelatin exactly where one would expect to find the pin. The scratch was not on the surface of the gelatin, and could not be seen by looking at the latter sideways so as to reflect the light from the surface. If this test had been present the error would have been more easily detected. The diagnosis was made by observing the irregular margin of the supposed shadow of the pin—a real pin would have given a clear-cut shadow. No operation was performed, of course, and the pin passed per anus."—B. Farquhar Curtis.

"In regard to foreign bodies, as to ineffective or mistaken operations, I recall only one case, that of a policeman, who was shot in the right thigh about one inch below the small trochanter; the scrotum was filled with blood. Fluoroscopic examination showed what appeared to be a bullet embedded in the testicle. At operation a diseased condition of the testicle was found, but no bullet. The bullet was located finally in the left leg about six inches below the small trochanter, and was removed."—Dr. W. J. Dodd.

"I myself had a case of bullet wound of several weeks' standing (the bullet lodged in the anterior part of the thigh under the rectus muscle), in which the bullet was located by X-rays several inches away from where it actually was. Some bits of clothing, coagulated blood, etc., made the shadow which was supposed to be the bullet."—W. L. Estes.

"The case misleading I have met with was one where a needle had

entered the heel. Apparently it was located by the X-ray, but when cut in upon could not be found. This case was twice operated on—once by myself and once by Dr. James Burry, of this city, each time ineffectually."—Christian Fenger.

"In reply to your letter of February 3d, would say that my only valuable personal experience with the X-ray in diagnosis of fracture is one in which the differential diagnosis was made between a fracture and a dislocation of the hip, thereby preventing a threatened suit for malpractice against a worthy country practitioner.

"Yesterday an ineffective operation was performed at Asbury Hospital, of Minneapolis, by a very competent surgeon. The skiagraph showed an open safety pin in the trachea just below the third ring. An opening and thorough search in both trachea and œsophagus failed to reach the pin.

"I know of two cases expected to come before the courts of this State in the near future in which the plaintiff sues for damages on account of burns from the X-ray."—J. E. Moore.

"In a very troublesome case of fracture of both radius and ulna near the wrist, with bad apposition, and where one of the bones was wired, the skiagraph seemed to show that the wire did not pass through the fragments."—John Owens.

"One of the most instructive cases of the errors likely to arise in connection with skiagraphs that I have seen, was that of a needle in the foot of a patient where it had been for six months, and of which I had two sets of skiagraphs taken at intervals of a few days, the patient being in bed all the time, and the foot remaining undisturbed in this interval also; consequently there was no chance for the needle to have been actually moved. . . . I failed wholly to find it on the first attempt, at which time I followed the indications furnished by the first set of views. A week later I tried again and found it, but not in the spot shown in any of the pictures. It did not overlap the second metatarsal or touch any bone at any point, but lay in the soft parts below and to the inner side of the base of the proximal phalanx of the great toe about half-way between the two positions shown in one of the skiagraphs, and well to the outside of the bone, remote from the position shown to be occupied by either of the other views.

"The error, so far as I can judge, arises from the difference of position of the camera with relation to the foot in the two pictures and the consequent difference of angle perspective.

"I could not help thinking if such skiagraphs were to be admitted as evidence in court how easily a lawyer could convince a jury that a surgeon who had had the picture to guide him in operating was an unfit person to treat such a case, for 'just look at it, gentlemen of the jury, why there was the needle right before this so-called surgeon's eyes,

where anyone who was not wholly incapable, or a native born fool, could have found it, and yet this man, etc.' Also, how good an example it furnished of the liability of error and of the value of such a demonstration in defence."—F. S. Watson.

"In reply to your communication of February 4th, I would say, first:

"(*a*) That I have found skiagraphy exceedingly helpful and fairly reliable in recent fractures attended with great swelling and injury to soft parts.

"(*b*) In fractures about joints the testimony of the X-ray is very valuable in showing the direction of displacements and of exact lines of fractures.

"(*c*) In epiphyseal separation the natural translucent condition of the epiphyseal juncture renders the process more unreliable but skiagraphy assists in determining displacement.

"(*d*) In fractures of the neck of the femur I have not found it positive, but if the operator uses judgment in the selection for the direction of the rays, the testimony is often of great advantage.

"(*e*) In ununited fractures skiagraphs taken from two or three points are of the greatest assistance in determining the question of necessity for operation.

"3. In one of my cases—a pistol-ball injury of the knee—the ball was located in the joint *at the internal condyle*, by two skiagraphs at different angles, but at operation it was found firmly embedded in the *posterior surface of the tendon of the patella*."—De Forest Willard.

In addition Dr. Keen has reported (*Philadelphia Medical Journal*, January 6, 1900) a case in which both the fluoroscope and skiagraphs very carefully taken showed a bullet apparently in contact with the surface of the tibia near its upper extremity. He cut down upon this point, but failed after an elaborate search to find the bullet anywhere on the tibial surface, but finally discovered it embedded in a deep cavity below the surface of the bone. He quotes from Dr. Ames, U. S. A. (who had made one of the skiagraphs), as follows:

"Recent bone formation does not make a shadow upon the screen, and I am unable to say how old the formation must be before obstructing the ray. Brief exposure will show a provisional callus upon a negative, when an overexposure will obliterate the impression of the new formation.

"Another point that I should have stated is that a 'mild' ray will show a new bone formation upon the screen which will not be shown by an intense ray—*i. e.*, a tube with a high vacuum. I have to my sorrow learned that the ray has many tricks, and we cannot always believe what we see, or rather fail to see, and a picture, to tell the truth, must have the plate, the object to be photographed, and the tube in proper relation during the exposure."

Dr. Keen adds: "This case is, I think, particularly valuable both as showing by means of Dr. Sweet's apparatus how accurately a foreign body can be located, and again how cautious we should be in interpreting what is apparently a perfectly plain case. We have yet to learn the errors into which we may be led by the X-rays, especially in cases in which medico-legal proceedings may be instituted and very unwise inferences drawn from what looks like a perfectly clear case."

In a communication to the *American Medico-surgical Bulletin*, July 10, 1897, Dr. George Everson, of Brooklyn, cites the following case, that is of unusually great interest from a medico-legal stand-point:

"Lillie B., aged fourteen years, diathesis syphilitic, was taken to a reliable X-ray studio by her father for a skiagraph of the left leg previous to operation on June 3d. The skiagraph shows at the middle and lower end of the shaft of the tibia exostoses. The lower end of the tibia is more translucent, and extending to the fibula from below upward and backward is a straight foreign body. At the operation, five days later, an incision from just above the ankle-joint to the tibial tubercle exposed two eburnations, one at the middle of the shaft and one at the lower third, numerous osteophites which do not show in the skiagraph, and the tibial articular end in formation ostitis, but on diligent search no foreign body."

In a paper read at a meeting of the American Academy of Railway Surgeons, October 6, 1897 (*Journal of the American Medical Association*, April 30, 1898), Dr. R. H. Reed, of Columbus, called attention to the dangers of mistakes in skiagraphs.

He illustrated his belief in them by detailing three cases from his own practice. In one a skiagraph of a pin which was supposed to have been swallowed showed that it lay just above the sixth rib at a point where it was impossible for it to have passed down the trachea and become lodged in either of the bronchi. This skiagraph led to a gastrotomy and an elaborate exploration of the stomach and œsophagus. At a later period another skiagraph appeared to show that the pin was just below and a little to the left of the superior margin of the manubrium. This led to the decision to do a laryngotomy, but the child died, after being placed upon the operating-table, from the rupture of an abscess which entered the trachea. The pin was found with the point protruding obliquely into the trachea just at the bifurcation of the bronchi, the body of the pin being beneath the œsophagus and the head lying between the fourth and fifth ribs close to the spine.

Dr. Reed was convinced from the amount of force required to remove the pin from its position that it had been there from the start, and that the apparent change was an optical illusion.

(*c*) As to renal calculi, while the results have been increasingly good, it seems worth while to mention the following cases:

"An unreported case of which I have heard occurred in an Eastern city, in which a collar-button had slipped down a man's back and was skiagraphed, and his kidney cut down under the impression that this was a stone."—W. W. Keen.

Dr. F. A. Packard, at a meeting of the College of Physicians of Philadelphia, mentioned one case in which the skiagraph showed what was thought positively to be a stone in the kidney, but was found to be later a mere defect in the plate. Dr. T. S. K. Morton, at the same meeting, took the ground that often when an X-ray picture is taken it is necessary that an expert should explain and interpret the X-ray picture as if it were a picture of what is seen in the microscope.

Dr. Keen has removed a calculus 12 mm. in diameter from a kidney which two skiagraphers had examined without obtaining any evidence of the presence of the calculus.—(Personal communication.)

"I do not know personally of cases in which the testimony of the X-rays has been found fallacious in the diagnosis of gallstones or kidney-stones, or has led to ineffective operations, though I do know of several cases where the attempt to utilize the X-rays for these purposes has been found quite disappointing and has been abandoned."—(Roswell Park, personal communication.)

I may briefly mention some of my personal experiences here without specially classifying them:

I have seen a bullet beneath the scalp elaborately localized as being a certain distance within the scalp cavity. I have seen—and worried over until I learned better—several soundly healed fractures with apparent non-union and deformity. I have seen (skiagraphically) such a displacement of the fragments of the radius three days after wiring both bones of the forearm for ununited fracture that I reopened the wound with the idea of correcting the deformity, only to find the position perfect and the wires holding the fragments immovable. I have seen a skiagraph of a shoulder after injury, with enormous hæmatoma, showing a fracture of the clavicle and a humerus intact, although the clinical diagnosis had been fracture of the neck and head of the humerus without clavicular injury. This was absolutely confirmed by a later skiagraph. It is fair to say that except for some minor error of localization my experience with foreign bodies has been in the highest degree satisfactory, as it has in cases of suspected or existing renal calculi.

My total indebtedness to the X-ray in cases of fracture is great, but it has not been essential, nor has it in any instance altered my diagnosis, prognosis, or treatment.

So far as the spine, pelvis, hips, and skull are concerned it has been useless.

4. In regard to X-ray burns there can be little doubt that they offer possibilities of trouble for both skiagrapher and surgeon.

Dr. Frank Boyd writes as follows to the *Journal of the American Medical Association* (February 12, 1898):

"In October, 1897, the undersigned was sued for malpractice in the sum of $10,000 for subjecting a patient to the X-rays which produced a severe dermatitis, the plaintiff setting up the claim that the apparatus was carelessly used, and, further, that the means used was not yet sufficiently well understood as to warrant its use for the purpose of locating foreign bodies, etc. The suit was ably contested, and fortunately was decided in my favor, the court holding that in this as in other cases the physician was bound to use ordinary skill and judgment, and placed the case upon the same footing as chloroform anæsthesia.

"Knowing that there were several suits of this character in the courts, I thought perhaps it would be of some interest to report it, since I have as yet been unable to find that the subject has been previously passed upon by the courts."

An interesting medico-legal possibility is reported by Dr. Ross as follows (*American X-ray Journal*, January, 1899, p. 501):

"Neither can we ignore the possible harm which might result in using it in cases of open wounds or injuries to the brain.

"In a case in which I used this method (the resulting skiagraph was taken after the man's death, three weeks later) the use of the X-ray was used as a defence, on the ground that it seriously jeopardized the man's chances, and that with the use of other anæsthesia to keep him quiet was not only seriously condemned by the defence, but the danger was so portrayed that with the rulings of the court and other circumstances attending the case the prisoner was acquitted on the charge of a deliberate murder, and our use of the X-ray was a great factor in bringing about this verdict.

"My greatest consolation in this case was that the same argument would have been used had I failed to use the X-ray to locate the bullet. Had the case died then the omission would have been claimed as neglect.

"As it was, it was argued that it was a source of extreme danger to the patient, jeopardizing his chances and leaving a 'reasonable doubt' in the minds of the jury as to whether he might not have recovered had the X-ray not been used, in spite of positive demonstration that no harm resulted from the X-ray or ether—the man living three weeks after the exposure and dying of meningitis, which existed at the time the examination was made and was due to the presence of a bullet in the brain."

In regard to this subject some careful experiments have been made by Profesor Elihu Thomson, a summary of which is given in a paper in a recent number of the *American X-ray Journal*, November, 1898, No. 5. Professor Thomson first produced dermatitis on the little finger of his left hand by exposing it, unprotected and unshielded, to the rays.

He then made a second experiment on the next finger, using a piece of sheet-lead with a window in it to limit the effect. One-half of this window was covered with aluminum foil, the other half being left open; dermatitis was produced both on the part that was unprotected and also where it was screened by the aluminum foil. From this he concluded that electrostatic effect or electro discharges were plainly ruled out. He also produced a burn on another finger from a tube run off an influence machine, and expresses the opinion that burns are produced by those rays of the X-ray order which are most readily absorbed by the flesh—viz., from tubes of low vacuum.

In the same journal there is an article by Dr. C. L. Leonard, of Philadelphia, on the subject of X-ray dermatitis. He maintains that the devitalization and destruction of tissue are due to the static charges which can be kept off by a metal screen connected to earth, and speaks of two cases where the rays were employed to produce a therapeutic effect, and where the omission of the screen allowed the static charge to produce a deep necrosis as the result of the devitalization of the tissues. We have here two opposite opinions, both apparently verified by experiment.—*Archives of the Röntgen Ray*, February, 1899, p. 68, 69.

Oudin, Barelemy, and Darier, of Paris, made an elaborate report to the International Congress in Moscow, in August, 1897, on the subject of burns from the X-rays, basing their conclusions on forty-four cases. They assert that judging from the accidents at present recorded they seem to have been caused by too strong an electric current; the tube being placed too near the skin; the duration of the exposure; too quick a repetition of the sittings; individual differences of sensibility; the presence of some disease of the skin. But no one of these conditions always causes an injury with certainty, and, on the other hand, an injury may occur without one of the conditions being fulfilled. Nothing, therefore, has been absolutely determined as to the actual mode of causation, but the discussion of the theories has led to certain practical rules being established which will diminish the chance of their happening.

To attribute the liability to these accidents of a certain small number of those operated upon to an idiosyncrasy does not help much, but it is certain that the condition of the skin which prevails at the time, its relative dryness or moistness, and the presence of scars is of importance to the question. It is doubtful whether the duration and frequency of the exposure is really the most important factor, for experience shows that often quite a few sittings, even a single sitting, and one which has not lasted long, may effect the changes. It seemed to the authors that the distance of the tubes from the skin was of far greater importance, for they found that all tubes, of whatever make or power, when approached to within 5 cm. of the tissues, gave rise to unmistakable irritation of the skin. Other investigators have met with the same results (Apostoli,

Buguet) when using old tubes, or such as had weak currents (1 ampère, 5-6 cm. spark); while the authors when using the large tubes, fed with strong apparatus (9-10 ampères, 50 cm. spark), never met with any accidents, because they invariably kept the tube at a distance of at least 50 cm. from the persons who were being examined. They think that the degree of injury varies inversely with the cube of the distance, and not with the square, as is the case with light and heat.—*Medical Chronicle*, 1897 and 1898, p. 293.

Dr. Charles Lester Leonard (*New York Medical Journal*, July 2, 1898), in an article on the "X-ray Burn, Its Production and its Prevention," makes the following remarks:

"The X-ray 'burn' is not the result of the action of the X-ray, nor can it be produced by the X-ray, but the dermatitis produced is the result of the static currents or charges induced in the tissues of the high potential induction field surrounding the X-ray tube.

"The therapeutic properties attributed to the X-ray do not belong to it, but are due to the static charges and currents induced in the tissues which have long been known to be capable of producing similar results.

"The X-ray, *per se*, is incapable of injuring the tissues of the patient, and the dermatitis, which has been called an X-ray 'burn,' is the result of an interference with the nutrition of the part by the induced static charges.

"The patient may be absolutely protected from the harmful effects of this charge by the interposition between the tube and the patient of a grounded sheet of protecting material that is readily penetrable by the X-ray—a thin sheet of aluminum or gold-leaf spread upon card-board making an effectual shield."

5. As to the general attitude of the profession on the subject of the possible fallacies of the X-ray, I subjoin such evidence as I have been able to collect, beginning with the letters from members of the Association:

"To my mind it is a question of interpretation and judgment."—W. H. Carmalt.

"If I may presume to express an opinion on the medico-legal value of the X-ray, I should like to say that if the skiagraph is to be admitted as evidence absolute proof (if possible) should be furnished that the skiagraph was taken under proper conditions so as to avoid all distortion as much as possible, and I may also state, even at the risk of repeating what you must have observed, that oftentimes a skiagraph shows a great deformity, yet the patient has a perfectly useful leg or arm. I speak of this, as I was very much impressed in the early days of skiagraphy with the fact that a jury composed of laymen would be very apt to be favorably impressed toward patients (as plaintiffs) by such a plate. I have noticed this particularly about the ankle."—W. J. Dodd.

"It is my opinion, based upon personal experience, that the practi-

tioner cannot be held liable to damages in malpractice suits, simply on the X-ray evidence of imperfect union of fragments in cases of fractures. The criterion of deformity should not be the skiagraphic image, but the external appearance of the part as recognized by the naked eye; if the external appearance is good there is no visible deformity and no imperfection in the limb from the *functional* point of view, then I would consider the result *good*, and the surgeon should not be charged with malpractice. I have known of at least one instance (fracture of both bones of forearm) in which the external appearance of the arm was excellent and showed no deformity. The functional result was also excellent as regards pronation and supination, flexion on extension, etc., and yet in the X-ray image the union was markedly defective, showing an apparent displacement of fragments. In this case I believe the result obtained was as good as possible, and from a purely practical and esthetic point of view was perfect, as the patient admitted himself. I saw no reason for refracturing or resetting the bone, and had it been a court case I would have refused to accept the Röntgen ray images as the test of malpractice."—Rudolph Matas.

"In my hands the employment of the X-rays has not been of especial value in establishing positive diagnosis of fracture or dislocations. It has seemed to me that in making positive diagnosis our older methods have been satisfactory. In certifying negative diagnosis, however, I have found the X-rays of value in a number of instances. In given cases in which it seemed exceedingly probable that no fracture existed the picture furnished by the X-rays has given me added confidence. I have thus far found it of no value in diagnosis of fractures of the neck of the femur or of dislocations of the femur.

"I am at this time emphatically of the opinion that X-ray pictures should not be admitted in the courts as evidence in medical suits; first, because these pictures may differ materially according to the thickness of the overlying soft parts, the position of the plate and the tube, the length of exposure and the like; and, second, because we are not as yet able to interpret correctly in all instances the pictures themselves. This uncertainty should prevent their being introduced and admitted as evidence."—Charles A. Powers.

"There are sources of deception, the nature of which is not fully understood."—N. Senn.

"Examination under anæsthesia has given me as accurate a knowledge of most injuries as I could obtain by the X-ray. I trust that I may be able soon to express another opinion, but for the moment I have none other to give. I venture to think that to accurately read a skiagraph is of primary importance, and I doubt if I am yet able to do this. Then, again, there are skiagraphs and skiagraphs which vary delightfully."—L. M. Tiffany.

"In fractures, too, I have learned also not to show the X-ray pictures to the patients, who, when he sees the outcome of treatment, believes it to be one that should be a better one."—Robert F. Weir.

The subjoined opinions have been selected from those expressed by medical men from various parts of the country. They indicate a widespread and earnest interest in the subject and a very general fear of the misuse of the X-rays.

Dr. J. Williams, of Macon (*Journal of the American Medical Association*, May 7, 1898), says that while the discovery of Röntgen was a material advance in surgical diagnosis, it was not an infallible aid. Mistakes in interpretation could lead to mistakes in operating, and its value as medico-legal evidence was doubtful. Three times during the past year Dr. Williams had been misled by the X-ray photography, twice into performing useless operations for lesions supposed to be dependent upon apparent bone injury, and in one case a supposed tumor proved to be an anomalous rib. Fortunately the operation was necessary, and the results were as satisfactory as they could have been had a tumor existed. He thought that either of the two photographs of the bone injury exhibited in a court-room would have been damaging evidence in a malpractice suit had not the operation disclosed the fallacy of the skiagraph.

Dr. Samuel Lloyd, of New York (*Journal of the American Medical Association*, May 7, 1898, p. 1111), believes the use of the X-ray in medico-legal work without careful preparation for that work on the part of the surgeon would do great harm. He says: "To leave a skiagraph to a single individual who might be interested in the case and go into court would be a grave error, for the deformity might be accentuated very decidedly by placing the tube in an improper position, and consequently in every case that has to appear in court the X-ray picture should be taken before witnesses who can swear to the position of the photographic plate, the position of the patient on the plate, and the position of the tube, and at the same time who can swear to the distance at which the tube was placed from the patient, so that allowances may be made for any distortion that may appear in the picture, and as far as possible to avoid distortion."

The *Journal of the American Medical Association*, May 28, 1898, says editorially:

"Until we can better estimate nature's capacity for repair the skiagraph may cause much needless anxiety, and still more unfortunately for our peace of mind show us errors in position which the condition of the soft parts will not allow us to safely correct, or the process of repair may in the occasional case develop rather than prevent deformity. The X-ray may be made to exaggerate the existing deformity or displacement, from carelessness or purposely, and in suits for dam-

age no skiagraphs should be accepted unless made by a disinterested operator."

Dr. B. Lacey, of Council Bluffs, Iowa (*Ibid.*), thinks that we ought to give the matter of the skiagraph of a fracture more consideration than we have heretofore. He adds: "It seems to be an accepted fact that a skiagraph can be easily made to either distort or exaggerate any shadow of a foreign body or of the displaced fragments in a fracture. I have some misgivings as to the use of a skiagraph in cases of oblique fractures for this reason. There are a great many people who think that a surgeon in treating a mangled limb must make it as good if not better than it was originally, or else he has not done right. On this basis we are too often apt to be mulcted in cases of malpractice suits, when any competent surgeon who examines the case, after understanding the circumstances, knows that the best that was possible was done for the patient. Personally, I dread the oncoming of the skiagraph in these cases, unless the future shall develop greater accuracy."

Dr. J. Hodges, of Anderson, Ind. (*Ibid.*), believes that it is important to know that existing fractures do not always show, and that there are undoubted cases on record in which the radiograph seems to show a fracture when it does not exist.

Dr. F. W. Ross (already quoted from) recognizes very fully the possibilities of error, as is shown by the remarks which follow (*American X-ray Journal*, January, 1899, p. 501):

"A case in France was decided against a corporation on the evidence of a skiagraph which showed that the bones had not been united, although there had been no other evidence than the picture.

"This was incorrect, as we know that bony union in fractures takes, in some cases, months or years to unite—some never completely ossify. This must always be considered. Here the decision was in error, as there were no physical signs of fracture existing. Hence, we should never accept as an assured fact that we have an ununited fracture or deformity when other evidences are wanting or are even negative, especially if the patient's subjective symptoms are liable to be biased with the prospect of indemnity. In estimating the amount of damage done not only must we always compare the injured with the sound side, but remember that some deformities, like those of the wrist-joints, may be quite extensive and yet perfect coaptation of the bony parts have been made—with union of bone—although deformity exists. This is particularly true in Colles' fracture.

"Again, our failure to see the cause of deformity in the X-ray is not evidence that it does not exist if other symptoms point to its being present. (The contrary line of reasoning in the French case cited.) . . . .

"Fractures and deformities may exist which, from the position, line

of fracture, effusion of blood, or character of deformity will not furnish evidence in a skiagraph or fluoroscope."

Dr. E. A. Tracy (*Journal of the American Medical Association*, November 6, 1897) remarks "that in all X-ray pictures there is distortion. The reason is that X-rays emanate from a point, and are not parallel. . . . Thus the nearer to their source is an obstruction to the rays the larger will be the resultant shadow or picture; the size of the shadow depends also upon the nearness of the object to the surface upon which the shadow falls; the further the surface from the object the larger the shadow. If we had for a source of X-rays a surface as large as the object to be pictured there would be no distortion, for the X-rays would be parallel. X-ray pictures in that case would be easy of comprehension, and never misleading. To read correctly the lesion of an X-ray picture the obliqueness of X-rays must be kept in mind and mental correction made for the disproportion and distortion caused by this obliqueness."

He illustrates by showing that with wires placed over the palm and wrist lines, merely turning over the hand between two successive skiagraphs appeared to have changed the relation of these lines to the bones, although, of course, it did not. He also calls attention to the differences in size and in outline, even in the same bones when taken from different angles." He concludes: "In my possession is a plate in which the deformity caused by Colles' fracture is quite closely simulated by a similar change in the position of Crooke's tube. The plate is of a normal wrist. The importance of this from a medico-legal point of view need not be enlarged upon."

Dr. Tracy writes again on the fallacies of X-ray pictures. He says that harm is threatened in the field of medical jurisprudence by the use of these pictures. They have been admitted as evidence in some courts, but he thinks their indiscriminate admission will result in injustice, because they can so easily lead to error. They should only be admitted as evidence of injury when they have been taken and presented under certain conditions."—*Journal Electro-therapeutics*, September, 1898.

Still later (*Philadelphia Medical Journal*, January 20, 1900) he writes:

"From practical work with X-rays I learned their fallacies more than two years ago, and hastened to bring the matter to the attention of the profession in the leading medical journal at that time. The importance of a knowledge of the fact to fellow surgeons who might be sued and indicted on the evidence of such pictures led me to publish the paper in which I do not assume, but demonstrate, the fallacies of X-ray pictures and explain some of their causes.

"The advantages of X-ray pictures in practice I fully appreciate and use daily in office work. Their great disadvantage—their fallacy—must never be lost sight of, especially in the courts."

J. Battersby, M.B., Major R. A. M. C., in an address on "The Present Position of the Röntgen Rays in Military Surgery," made the following remarks (*Archives of Röntgen Rays*, February, 1899, p. 76):

"For our own reputation and the welfare of our patients many important conclusions would be arrived at if we invariably made it a routine practice to examine with the Röntgen rays every case or suspected case of fracture that comes under our observation."

Oberst, of Halle, and Dr. Richardson, of Boston, found as the result of such a systematic course of examination that under ordinary treatment

"(1) Perfect union is rare.

"(2) Oblique fractures generally have some overriding.

"(3) In deep-seated bones there may be much bony deformity unrecognized.

"(4) If functional disturbance continues after treatment overriding is the rule."

H. P. Pratt (*American X-ray Journal*, April, 1899) says:

"While the X-ray is of advantage to the surgeon it has its disadvantages. Ever since its discovery, especially in the last year, every malicious person who can scrape up enough money to pay for a shadowgraph is having one taken for the purpose of bringing a damage suit for personal injuries or malpractice. It is coming to this: that a surgeon is not safe unless he has a shadowgraph taken before and after each operation. It is surprising to see the number of damage suits now pending against corporations, individuals, and especially surgeons for supposed injuries sustained or for malpractice, depending entirely on the shadowgraph as evidence. I will say the shadowgraph is not competent evidence because there is an opportunity for a great fraud to be perpetrated. Even the operator, if he is not careful, can be deceived himself. I have defended several corporations against shadowgraphs which showed a fracture where no fracture ever existed. An operator skilled in X-ray work can deceive the most skilled if they are not on their guard."

The Medical News (February 3, 1900, p. 192) quotes Lucas Championnière as to the dangers of being misled by a radiograph of a callus after fracture if the light was held in a wrong position when the radiograph was made. "Even when manual examination shows the bone to be united in a good position a radiograph may make it look much deformed. In consequence some surgeons have denied the accuracy of these shadow pictures. There is danger also that they may be used to influence the mind of a jury in a suit for malpractice. The volume, dimensions, and form of the shadow vary not only with the distance of the object from the plate, but from the light as well, so that two successive radiographs, unless the bone, the photographic plate, and the light are in exactly the same

position, will show two different deformities at the site of fracture. This variation in the size of objects is readily shown by taking a radiograph of a hand holding a needle, and then taking a second one with the light at a greater distance. The needle in the former case may easily appear twice as long in comparison to the bones of the hand as it does in the latter. These facts should be borne in mind in forming an opinion from a radiograph as to the amount of deformity which follows a fracture."

The *Lancet* (vol. xi. 1899) says editorially:

"Everybody knows that a photograph may be easily made to tell untruths and that a like unstable veracity may attach to skiagrams is clearly pointed out in an article in the Minneapolis *Times* quoted by the *Literary Digest* of New York. The matter has an important bearing on forensic medicine, and we therefore reproduce the paragraph:

"'A Chicago electrical specialist has been making some interesting experiments at the suggestion of the attorneys of the Chicago Railway Company and others, and the results are somewhat startling. They tend to show that shadowgraphs may need a great deal of corroboration when introduced as evidence in a damage suit. One of the lawyers exposed his hand before the machine with the muscles relaxed, fingers extended, and the member generally in normal position. The shadowgraph showed the bones to be in perfect condition. The attorney then made a second exposure of the same hand, cramping the first joints of the fingers slightly. The ends of the fingers appeared to have been crushed, and the bones were apparently of unnatural size. In another experiment the operator showed that it was possible to arrange an object on the outside of the body and make it appear to be lodged within. Thus a bullet placed in the clothing on the back of the body was shown in the shadowgraph as resting against the spine. The expert stated further that he had learned by long experience that it is possible for the operator himself to be deceived as to the location of an object disclosed by the X-ray machine.'"

Dr. Willard, of Philadelphia, in a paper on the "The X-ray and its Use in Surgery," said:

"Although skiagraphy is a most valuable assistant to the surgeon, yet a word of caution is necessary. It has been most conclusively shown that the position of the tube, the direction of the rays, the method and time of the exposure, the magnification of portions of an object not in contact with the plate, the elongations of shadows from distant portions of an object, together with other varied conditions, may so completely distort the resultant image that error is certainly possible. A fracture may appear to exist when a bone has not been broken, and, on the other hand, it has been shown that a known fracture produced by osteotomy is not discoverable. These facts make it imperative that the medico-

legal value of these radiographs should be considered carefully, and pictorial evidence should receive only its due amount of consideration in connection with clinical evidence. Clinical evidence should have, and does have, large weight in the question as to results after fracture and other injury. Knowledge obtained by long experience and positive indications is far more valuable than any representation visible alone to the eye."

Williams and Lloyd (*Annals of Surgery*, October, 1898) write on the X-rays in medico-legal cases. They are not enthusiastic as to the value of such evidence. In taking these pictures it is very easy to increase in the picture any existing deformity by just placing the tube slightly out of proper position. Hence, if an X-ray print is presented in court it should have been taken before witnesses who can prove the position of the patient, the tube, and the photographic plate, and the distance it was from the tube.

Edmund Owen (*The Practitioner*, May, 1899) "shows that individuals who have been treated for fracture and who have gone around with ease and comfort may exhibit in an X-ray picture noteworthy deformity, and if an enterprising solicitor gets hold of such a case and exhibits such a deformity to a sympathetic jury, it is not improbable that damages might be meted out to the physician. Inconvenient illuminations of badly set fractures and in other cases in which nature has not been enabled to triumph over osseous lesions are becoming of frequent occurrence, as patients are getting in the habit of having pictures taken after some surgeon has made a diagnosis, and mistakes are thus nailed to the barn-door."

Mr. Golding Bird (*British Medical Journal*, April 21, 1900), in a clinical lecture recently delivered, said:

"I would here warn you all of a danger in skiagraphy. I know that it has happened for a patient to have his limb skiagraphed after he had been properly treated, and because the picture showed an exceedingly slight irregularity along the edge of the bone indicating the position of fracture, he went from one surgeon to another to obtain an expression of opinion that the union of the fracture was not perfect, in order that he might sue for damages the gentleman who had treated him. You will find that few fractures will bear the test of photography in that sense, and I should warn you against appealing to it in your own work as proof of the goodness of your treatment, lest you should be called to account for having produced a union of the bone absolutely as perfect in appearance as it was prior to the accident, although its utility now may be in no way impaired."

With this review of a small portion of the existing evidence the following conclusions are respectfully offered to the Association for discussion:

1. The routine employment of the X-ray in cases of fracture is not at present of sufficient definite advantage to justify the teaching that it should be used in every case. If the surgeon is in doubt as to his diagnosis, he should make use of this as of every other available means to add to his knowledge of the case, but even then he should not forget the grave possibilities of misinterpretation. There is evidence that in competent hands plates may be made that will fail to reveal the presence of existing fractures or will appear to show a fracture that does not exist.

2. In the regions of the base of the skull, the spine, the pelvis, and the hips, the X-ray results have not as yet been thoroughly satisfactory, although good skiagraphs have been made of lesions in the last three localities. On account of the rarity of such skiagraphs of these parts special caution should be observed, when they are affected, in basing upon X-ray testimony any important diagnosis or line of treatment.

3. As to questions of deformity, skiagraphs alone, without expert surgical interpretation, are generally useless and frequently misleading. The appearance of deformity may be produced in any normal bone, and existing deformity may be grossly exaggerated.

4. It is not possible to distinguish after recent fractures between cases in which perfectly satisfactory callus has formed and cases which will go on to non-union. Neither can fibrous union be distinguished from union by callus in which lime-salts have not yet been deposited. There is abundant evidence to show that the use of the X-ray in these cases should be regarded as merely the adjunct to other surgical methods, and that its testimony is especially fallible.

5. The evidence as to X-ray burns seems to show that in the majority of cases they are easily and certainly preventable. The essential cause is still a matter of dispute. It seems not unlikely when the strange susceptibilities due to idiosyncrasy are remembered that in a small number of cases it may make a given individual especially liable to this form of injury.

6. In the recognition of foreign bodies the skiagraph is of the very greatest value; in their localization it has occasionally failed. The mistakes recorded in the former case should easily have been avoided; in the latter they are becoming less and less frequent, and by the employment of accurate mathematical methods can probably in time be eliminated. In the meanwhile, however, the surgeon who bases an important operation on the localization of a foreign body buried in the tissues should remember the possibility of error that still exists.

7. It has not seemed worth while to attempt a review of the situation from the strictly legal stand-point. It would vary in different States and with different judges to interpret the law. The evidence shows, however, that in many places and under many differing circumstances the skiagraph will undoubtedly be a factor in medico-legal cases.

8. The technicalities of its production, the manipulation of the apparatus, etc., are already in the hands of specialists, and with that subject also it has not seemed worth while to deal. But it is earnestly recommended that the surgeon should so familiarize himself with the appearance of skiagraphs, with their distortions, with the relative values of their shadows and outlines, as to be himself the judge of their teachings, and not depend upon the interpretation of others who may lack the wide experience with surgical injury and disease necessary for the correct reading of these pictures.

[These conclusions were unanimously adopted as expressing the views of the American Surgical Association.]

REPORT OF A CASE OF ACUTE ASCENDING PARALYSIS, SHOWING HÆMATOPORPHYRINURIA.

By Charles G. Stockton, M.D.,
of New York.

The patient, twenty-seven years old, was a domestic. Her father, when past middle age, died of some unknown cause; the mother and one brother of tuberculosis; three sisters are alive and well. Previous to the past two years the patient had lived for six years in the family of a physician, and it is known that she was well and strong. For two years past she had overworked and felt that she was losing her health. She had decreased twenty pounds in weight, but there was no specific disease. About a year ago she had obstipation of the bowels, and at one time went without an evacuation for fourteen days. In the early part of August last she became nervous and irritable, and was so anæmic that her employer requested Dr. Albert E. Woehnert to examine her. The girl appeared to be hysterical, and the other servants complained that she disturbed them. At night she tossed about in sleep and arose tired in the morning. Although she complained of a disagreeable taste, the appetite was good, tongue clean, and bowels regular. The pulse was 80 and the temperature 99.2°. Simple nervines were administered, and her temperature carefully recorded morning and evening for a week. The highest point reached was 99.4°. The urine was of a very dark color, acid, free from sugar, contained a trace of albumin, and was microscopically negative. Alkalies, alteratives, and nervines were given. The girl went into the country and returned on the 28th of August somewhat improved, having gained several pounds in weight, and declared that she was much better. On the 4th of September she was feeling well, but still complained of a disagreeable taste in the mouth.

On September 7th she came to the doctor's office and complained of pain in the back and abdomen. She was again nervous and was now unable to sleep. He prescribed sodium salicylate and sulphonal, three doses of five grains each, but these were vomited. Next day she was no better and had not slept. On September 29th the patient was still sleep-

less, nervous, and the pain in the back continued. Pulse ranged between 50 and 64. She had vomited a little and the bowels were constipated; the urine was of claret color, 1025 specific gravity, contained neither albumin nor sugar; indican, a small trace; it was highly acid, and negative microscopically.

The patient was sent to the Riverside Hospital, where she remained for one week, during which time she was restless, slept but little—not at all during the first three days—and complained of her stomach. Sulphonal (15 grains) the first night, and trional (15 grains) the second night, failed. These drugs thereafter were not given, and some rest was obtained from morphine and the bromides. Asafœtida and valerian were also administered, and, apparently, with benefit. On the 14th of September, against the protests of the hospital, she went home, where her temperature was still carefully taken. It showed but little variation, and the patient's condition could not be explained. Incipient tuberculosis was suspected. Physical examination of the chest showed, on inspection, equal and good expansion on both sides, anteriorly and posteriorly. The vocal fremitus was normal, slightly greater in the upper right chest. On percussion, the note was slightly higher pitched in the same region; posteriorly, there was no difference. On auscultation, the expiration was prolonged in the right supraclavicular and infraclavicular regions. There were no râles, although faint crackling was heard at the left apex. The first sound of the heart was weak, and the second pulmonic sound was over-accentuated; the physical signs were otherwise normal. The liver and spleen were of normal size; the lower border of the stomach was two inches below the xiphoid. The stomach contents, examined two and one-half hours after a breakfast of finely chopped beefsteak with stale roll and butter, showed three ounces of well digested contents, with free HCl, 0.05 per cent., total acidity 80, and a good biuret reaction; some undigested starch, no lactic acid, good motion, and good absorption. At this time were passed 700 c.c. of urine in twenty-four hours, acid, claret color, 1020 specific gravity, a trace of albumin and indican, but no sugar, and it was negative microscopically. The further examination of the abdomen showed that it was not distended, nor tender on pressure. She had an excited and apprehensive appearance; her pupils were dilated; she was very nervous, and slept only when under the influence of morphine or the bromides. The urine continued of a claret color; the patient occasionally seemed to wander in her mind. She said she had no sensation in the buttocks when sitting down. This region was found to be anæsthetic. She soon defecated and urinated unconsciously and involuntarily.

The patient was so excited and restless at home that on the 18th of September she was sent to the Buffalo General Hospital, a diagnosis not having been made. When she entered the hospital she gave a history of stomach trouble dating from the middle of August. After eating she had experienced gastric distress accompanied by eructations of gas and a feeling of weakness and dizziness, and said that two weeks ago she was taken suddenly with a dull pain in the back, and now complained of a feeling of numbness and tingling in the feet. She said that this feeling had been experienced for several days, and at the same time she had lost strength and appetite. She now had weakness in her legs and involuntary and unconscious evacuations of the bladder and bowels; she did not feel the moisture; in the past twenty-four hours she had

occasional shooting pains in the legs. On entrance she felt as though she were losing her speech; was tired and sleepy, although unable to sleep. The temperature was 101.5° and the pulse 110. The following day she had little sensation or motion in the legs, and the deep and superficial reflexes were absent. On September 20th all sensation and motion had disappeared from the lower extremities; both motion and sensation of the trunk and upper extremities were much diminished. She was clear mentally, but frightened. The urine had the same claret color, although she had taken neither sulphonal nor trional for over a week.

On the 21st of September she was, at my request, examined by Dr. James W. Putnam, at which time there was found slight voluntary movement of the extensor muscles of the arm only. The deep and superficial reflexes were absent, and there was no response to the faradic current in the legs. There was slight electrical response in the extensor muscles of the arms and wrists—better on the right than on the left side. Sensation in the extremities and trunk had practically disappeared. On the 22d the area of diminished sensation extended upward to the level of the neck, but she had now regained the power to flex both feet slightly; she could not move the upper extremities at all. At times she was slightly delirious. On the 23d the motion of the feet was more noticeable; there was none in the hands. She had become somewhat dull mentally, but was rational when roused, and complained only of being tired, and frequently asked to have the position of the arms and legs changed. The temperature was 100° F., the pulse 135, and the respirations 35.

On the 21st of September, Dr. Lorenzo Burrows, Jr., made an ophthalmoscopic examination, which showed that on the nasal side of both optic disks there was swelling and congestion, the vessels being slightly tortuous, and the condition was believed to be the beginning of optic neuritis. On the 24th there was no change noticed in the condition of the eyes. On this date there was undoubtedly improved motion in the feet, and the patellar reflexes could be faintly excited.[1] There was complete loss of motion of the arms; she was unable to feel in the breast the large hypodermatic needle used in introducing subcutaneously the normal salt solution; she was practically without sensation except in the head. The mind wandered slightly, but she responded rationally to all questions. Toward evening she complained of oppression in the chest, making it difficult to breathe. At 11.30 P.M. she complained of thirst and drank eagerly. The pulse was 135 and the temperature 100° F. She said that she felt well, only that she was "so tired." Her consciousness was perfect until immediately before 12.15 P.M., when she died quietly.

The clinical diagnosis was that of acute ascending myelitis, involving all tracts of the cord. The treatment was limited to the use of normal salt solutions subcutaneously and diaphoresis by means of baths. Sleep was encouraged on two or three occasions by small doses of codein. An autopsy was positively refused.

A remarkable feature of the case was the persistence of the claret-colored urine. When first observed the color was dark amber or brown.

[1] There is a possible error in this observation.

After three doses, containing each five grains of sodium salicylate and sulphonal (which, by the way, were believed to have been vomited), the urine was noticed to be claret color, and it continued so to the end. A specimen was referred to Dr. Thomas B. Carpenter, clinical pathologist of the hospital, who made the following report on the coloring matter: Methæmoglobin, oxyhæmoglobin, alcapton, indol derivative, scatol derivative, phenol derivative, urorubrohæmatin, urofuscohæmatin were all examined for and found to be absent. Hæmatoporphyrin, however, was present, and accounted for the claret-colored urine. The vegetable pigments were absent; the urobilin derivatives were not present in sufficient amount to produce color.

Dr. Carpenter forwarded a specimen to Prof. J. Bergen Ogden, of the Harvard Medical School (whose article on hæmatoporphyrinuria appeared in the *Boston Medical and Surgical Journal* of February 24, 1898), who coincided with him that the pigment was hæmatoporphyrin.

The question suggests itself, Is there a direct relation between acute inflammatory processes of the cord and spinal nerves and the appearance of hæmatoporphyrinuria? Ogden, in the paper referred to, reports a case of post-diphtheritic neuritis which was under the care of Dr. Geo. B. Shattuck and Dr. C. F. Withington, of the Boston City Hospital, in which there was loss of sensation, reaching upward to the waist line, accompanied with involuntary micturition and dejection, and in which hæmatoporphyrinuria was present. In this case also it is possible that the condition was secondary to the taking of trional, which had been given in gramme doses. But there had elapsed a period of eleven days on one occasion between the taking of the drug and the appearance of the pigment in the urine. In my case it is believed that the coloring matter appeared before either trional or sulphonal had been taken, as the urine was observed to be very dark, although not distinctly claret color, more than four weeks before either drug was administered. Two days after taking fifteen grains of sulphonal in divided doses, which were believed to have been vomited, the claret color of the urine attracted attention. On the 9th of September one gramme of sulphonal was given, and on the 10th one gramme of trional. She died on the night of the 24th of September, and the symptoms of hæmatoporphyrinuria were continuous from the 10th to the 24th. It is thus seen that fourteen days elapsed without the administration of the drugs in question, and that only one gramme of each had been taken.

A CASE OF BROWN-SÉQUARD PARALYSIS.

By Richard F. Woods, A.M., M.D.,
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Brown-Séquard, the French physician, in 1863, reported a number of cases of paralysis, the result of unilateral section of the spinal cord. The summary of his investigations both from clinical cases and from experiments on the lower animals was, that if an alteration of the right side of the spinal cord exists, it produces a loss or a diminution of voluntary movement on the right side of the body and a loss or a diminution of sensibility on the left side, and *vice versa;* and, furthermore, the sensibility on the side of the motor paralysis is not only normal, but there is a pronounced hyperæsthesia for all, or at least for some, of the forms of irritation.

The following case presents most of the symptoms of unilateral lesions of the spinal cord described by Brown-Séquard, and, although the patient came under observation more than one year after the injury, the symptoms at that time were so well marked as to make the diagnosis certain. I am indebted to Dr. Henry Fisher for permission to report the case, and to Dr. F. J. Douglas for information about the patient while he was under his care in the Utica Hospital, New York.

The family history and previous history had no bearing on the patient's condition. He denied syphilis. The accident from which he suffered occurred on January 29, 1898. He was leaning over the railing of a porch when he was struck forcibly in the back of the neck with a knife.

He fell immediately to the ground, and when he attempted to get up he found that he could not raise his left leg or left arm. There was no loss of consciousness after the injury, although he says he felt considerably dazed. He was carried to the Utica Hospital, and his condition while in that hospital is described as follows by Dr. Douglas, who had him in charge: On admission there was complete paralysis of the left arm and leg. No loss of consciousness and no paralysis of the face. There was a punctured wound in the median line of the neck between the fifth and sixth cervical vertebræ. This wound was probed shortly after his admission and found to extend toward the left, and was about one inch in depth. There was slight bleeding from the wound.

He had incontinence of urine, but there were no rectal symptoms. His reflexes were tested on admission, and found normal. Temperature and pulse were also normal. The sensory condition was not noted.

The patient remained without improvement until the fourth week, when there was some movement noticed in the left hand. The next week movement returned slightly in the left leg.

From this time he continued to improve slowly, and in about seven weeks he was able to walk for a short distance. The wound in his neck had healed by first intention, and his general condition was good.

He remained in the hospital for two months, and when he was discharged he could use his left arm only slightly, and could also walk, but in a very uncertain manner. The man after he left the Utica Hospital was without treatment of any kind until he came to the Pennsylvania Hospital Medical Dispensary, in May, 1899, more than one year after his discharge from the Utica Hospital.

His condition when he presented himself at the dispensary was as follows: He was well nourished, muscular, and fairly intelligent. Pupils were normal. Pulse regular, good strength, and volume. Tongue protruded in median line. Lungs, heart, abdomen, spleen, and liver normal. On the back of the neck, to the left of the median line, about the level of the fifth cervical spine, was a small scar, the result of the punctured wound. His gait was unsteady and he dragged his left leg in walking.

When standing there was a fine tremor of the left leg, very slightly marked in the left arm.

The grip of the right hand (non-paralyzed) was much stronger than the left (paralyzed), and the left arm and leg showed atrophy, probably due to disuse.

The measurements of the arms and leg were as follows: Right arm: forearm, uncontracted, 26½ cm.; contracted, 28½ cm.; calf of leg, 36 cm.

Left arm: forearm, uncontracted, 24 cm.; contracted, 26½ cm.; calf of leg, 34 cm.

The patellar reflex was much exaggerated on the paralyzed side. The patellar reflex on the non-paralyzed side seemed normal. There was ankle clonus on the paralyzed side. The reflexes in the paralyzed arm were also exaggerated. The superficial reflexes were not altered.

The alteration in sensation in this case is very interesting, as it is so similar to Brown-Séquard's description of this symptom in his own cases.

1. In the left leg (paralyzed) the tactile sensibility was increased over the whole limb, while in the right (non-paralyzed) tactile sensibility was greatly decreased. The slightest touch of a camel's-hair brush was plainly felt in the paralyzed limb, while it was lost in the non-paralyzed. In using the æsthesiometer, the two points were easily distinguished on the paralyzed leg, while on the non-paralyzed, although two points were pressing, only one could be recognized by the patient.

2. There was hyperæsthesia to painful impressions in the paralyzed limb. Pricking and pinching gave him considerable pain. On the opposite side there was analgesia.

3. Muscular sense was lessened in the paralyzed limb, unaltered in the non-paralyzed.

4. Temperature sense was increased in the paralyzed leg, while it was lost in the non-paralyzed.

5. The patient could easily locate a sensitive impression in the paralyzed leg, but was unable to do so in the non-paralyzed limb. In regard to the upper limbs, the alteration of sensibility was the same as in the legs, with the exception of tactile sensibility, which was not affected on the non-paralyzed side, and was therefore not in proportion to the loss of sensibility to pain, which was certainly great in the non-paralyzed arm.

In regard to the vasomotor changes, although the surface temperature

was not taken by thermometer, the paralyzed leg was much warmer to the touch than the non-paralyzed. There was no change of temperature noticed in the arms.

The area of the alteration of sensation seemed limited above by a line drawn from a point about half an inch above the sternoclavicular junction in front, extending over the acromion process of the scapula to the second dorsal behind.

To sum up the symptoms in this case we had on the side of the lesion a paralysis of voluntary movement of muscular sense and probably vasomotor paralysis. There was hyperæsthesia of the trunk and limbs, increase of reflexes, and ankle clonus, while on the non-paralyzed side there was anæsthesia and no paralysis.

The following points appear of special interest:

1. There was loss of motor power in the arm and leg on the side of the lesion. This is due to the fact that the motor fibres for the arm and leg crossing at the decussation of the pyramids pass down the cord in the anterior and lateral columns of the side of the limbs concerned.

2. There was anæsthesia for all kinds of sensibility in the leg opposite the side of the lesion. This confirms the original theory of Brown-Séquard, that the sensory fibres decussate immediately after or within a short distance of their entrance into the cord, and pass up the opposite side.

Anæsthesia for all kinds of sensibility appears, however, in this case to be true only of the lower extremities, for in the arm, opposite the side of the lesion, although the sensibility to painful impressions was lost, tactile sensibility was retained.

This is true in a great many reported cases observed sometime after the onset of the symptoms. In Gower's case (*Clin. Soc. Trans.*, xi., p. 24) there was no loss of tactile sensibility and only incomplete analgesia. As an explanation of the cause of this phenomenon Schiff says that while the fibres conducting sensibility to pain decussate soon after they reach the cord and the sensations are conducted on the opposite side, the tactile sensations are conducted by the posterior columns of the same side and do not decussate.

Turner, from experiments on monkeys, comes to the following conclusion: That after a unilateral section of the spinal cord in the cervical region all forms of sensibility are not abolished in the non-paralyzed arms. Sensibility to painful impressions was absent or defective, but tactile sensibility was retained. This would indicate, continues Turner, that the fibres subserving tactile sensibility for the arms pass up both sides of the cervical cord, while those subserving painful and temperature sensibilities pass up the opposite side.

3. There was hyperæsthesia to touch and to all painful impressions on the side of the lesion. This Brown-Séquard thinks is due in a

great measure to a paralysis of the vasomotor conductors causing a greater influx of blood and a higher temperature; but, according to Michael Foster, it is due to a withdrawal by the injury of an inhibitory influence of some higher centre in the gray matter, by which the sensation is conducted—an influence which in the normal condition moderates the action of the gray matter.

4. The muscular sense was diminished on the paralyzed side, normal on the opposite side. This diminution of muscular sensibility, according to Brown-Séquard, is due to the fact that the fibres for the muscular sense run their course in the spinal cord uncrossed, just like the motor fibres.

Ferrier found in monkeys that after a hemisection of the spinal cord the sense of the positions of the limb appears absent not on the paralyzed side, but on the opposite side.

5. The deep reflexes were exaggerated on the paralyzed side. This is probably due to the cutting off of the reflex inhibitory influences coming from their centre, which is in the optic thalamus. The ankle clonus may also be assigned to loss of inhibitory influences. In nearly all the cases observed immediately after the injury the knee-jerk is absent or diminished on the paralyzed side, and normal or slightly increased on the opposite side, but during the progress of the case returns, and in the course of time becomes exaggerated. The experiments of Ferrier on monkeys show that immediately and for a short time subsequent to the operation the knee-jerk on the side of the lesion was in abeyance or very much diminished, while that on the opposite remained normal, but in a short time the absent knee-jerk returned and became much exaggerated.

In some cases of unilateral lesion above the hyperæsthetic area there was a small zone of anæsthesia. This symptom was absent in the above case.

Brown-Séquard thinks it is caused by the immediate involvement of the fibres conducting sensitive impressions which reach the cords through the posterior roots at a level or a little below the seat of injury. These fibres have to pass through the altered points to reach the other side of the cord.

The cause of Brown-Séquard paralysis has varied. Sections of one lateral half of the cord have been produced by stabs from sharp instruments. Compression, tumors of the cord, and inflammatory conditions may all cause a more or less sharply defined unilateral lesion.

In Gower's case the paralysis resulted from a gunshot wound in the mouth, the ball passing through the back of the throat and interrupting the conduction of the right half of the spinal cord.

In a case of Starr's (*Brain*, 1894) the paralysis resulted from caries of the fourth and fifth cervical vertebræ.

Russel reports a case (*Medical Times and Gazette*, 1863) caused by disease of the cervical spine following rheumatism.

In MacKenzie's case (*Lancet*, 1883) the paralysis came on without any apparent cause, but the conclusion was finally reached that it was due to a syphilitic gumma.

In the *Lyons Medical Journal*, 1896, Pauly reports a case caused by a fall from a tree, fracturing the cervical vertebra.

In only one reported case convulsions have followed the injury. This occurred in one of Brown-Séquard's cases (*Lancet*, 1868, vol. ii., Case I.). I can add nothing as to the treatment and prognosis of this interesting group of symptoms following unilateral lesion. The patient was under observation for only ten days, when he left the dispensary and his whereabouts were impossible to determine.

EXCISION OF THE LACHRYMAL SAC AND GLAND,

FOLLOWED BY AN UNUSUAL VARIETY OF NEUROPARALYTIC KERATITIS, MARKEDLY RESEMBLING CLINICALLY THE SO-CALLED LATTICE-LIKE KERATITIS.[1]

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S. D., a married woman, aged fifty-eight years, was brought to me first in the early part of November, 1899, with an attack of acute dacryocystitis of the right side, the attack being the third within a few months. The abscess was opened and treated in the usual manner, healing taking place in about ten days with a patent duct and no fistula, Bowman's probe No. 7 being easily passed. The patient lived in a sparsely populated district, eight miles from the nearest physician, the latter being obliged to ride this distance in order to render his services. He was instructed in the use of the lachrymal syringe and advised to keep the duct patent and frequently cleansed.

The patient was of an exceedingly neurotic temperament, a condition that seemed to be hereditary, and that had affected all the female members of the family alike. There was a vague history of another member having had some inflammatory condition similarly situated that was finally pronounced to have been cancer.

Five weeks from the time the patient was first seen she presented herself, with another attack even more severe than the first, and as she refused to remain in the city for treatment longer than a few days after the acute symptoms had subsided, a silver canula was inserted into the duct. At her urgent request the physician was again instructed as to

[1] Read in abstract at the thirty-sixth annual meeting of the American Ophthalmological Society.

the method of removing the canula and cleansing the duct, and she was advised to come to see me again in two weeks. This she did, and the canula was found in place, the symptoms having subsided, and the fistula healed; but when she next reported, at the expiration of another two weeks, the lower end of the canula was found in the upper portion of the nasal cavity, having been forced through the lachrymal bone. Drainage was naturally imperfect, and there were symptoms of the formation of another abscess, the secretions being dammed up in the sac and nasal duct, it being impossible to effect an opening into the nose. Considering the distance of the patient from medical aid, the fact that she had suffered from several attacks, and that she absolutely refused to remain in the city for a sufficient length of time to allow me to treat the duct until it was well, it was advised that she have the lachrymal sac and gland extirpated.

This was done on the following day under ether anæsthesia without any complication, the method advocated by Holmes[1] being closely followed. The nose had been sprayed several times with a 1 : 2000 solution of potassium permanganate and the lower nasal meatus plugged to prevent hemorrhage from passing into the throat. A slightly curved incision was made over the lachrymal sac in the natural line of the face, and when the sac was exposed it was so bound down by adhesions that it could not be dissected out as a whole, but came away piece-meal. What remained was carefully removed with the curette, the next step being to obliterate the nasal duct. For this purpose Skeel's chalazion curette was found most admirable, it being small enough to pass into all portions of the canal. The wound was then closed with deep and superficial sutures. The incision for the removal of the gland was made just beneath the eyebrow on a line corresponding to and following the outer third of the orbital margin. The gland was reached without difficulty and with very little hemorrhage and the larger lobe removed by careful dissection. This wound was also closed by deep and superficial sutures. On the second day after the operation, when the dressings were first removed, some drooping of the upper lid was observed. On the fourth day half the sutures were removed, and on the fifth day the remaining half, the dressings being discarded.

On the eighth day following the operation, after the lid had regained about half of its lost movement, the lips of the wounds had firmly united and the sites of the incisions were indicated only by two narrow lines, but the patient complained of intense pain in the eye, which was accompanied by some conjunctival secretion. Inspection of the cornea did not at this time reveal anything abnormal, so far as could be seen; but on the following day, the ninth since the operation, there was a severe membranous conjunctivitis in both eyes, the membrane peeling off easily and leaving a smooth, not unusually red surface beneath. The cornea of the right eye was slightly abraded near the centre and considerably roughened, as if sprinkled with some coarse substance, staining readily with fluorescin, the edges of the abrasion being irregular, as if a bulla had broken and the edges curled. There was no anæsthesia of the cornea, conjunctiva, or surrounding parts. Hot and cold compresses and frequent irrigations were employed, but with little

[1] C. R. Holmes. Extirpation of the Lachrymal Sac and Gland. Archives of Ophthal., 1899, vol. xxviii., No. 1.

benefit, so far as the reduction of the membrane was concerned, the latter re-forming within an hour after being removed. Bacteriological examination of the latter showed only the diplococcus of Fränkel in small numbers. Frequent irrigations, hot fomentations, and the internal administration of stimulating treatment were kept up constantly. The site of the abraded portion of the cornea would shift from day to day, but at no time was the epithelium completely re-formed. At the time this was supposed to be due to the fact that bullæ had formed and broken, but at no time did we see a bulla before breaking, if any were ever present.

On the fifth day, after the beginning of the above series of symptoms, the roughened epithelium occupied about two-thirds of the corneal surface, and the latter was becoming quite hazy, especially in the lower inner quadrant. With the loupe the deeper portion of the cornea, probably Descemet's membrane, was seen thrown into folds, forming the so-called panel figure, described by Schirmer, by the crossing of the lines of the folds, this being much more marked in the most hazy portion of the cornea, and probably due to the unequal swelling of the latter. A little later the anterior portion of the corneal tissue became involved, and there appeared numerous minute lines, some straight and others branching, and while these were more marked near the centre of the lower inner quadrant—that is, the most hazy portion of the cornea —they were also present in all the quadrants. A narrow strip of the cornea, about 1½ mm. wide in the periphery, seemed unaffected. These fine lines continued to increase in number and to cross each other in such a manner as to give the appearance of a lattice work, the openings between the lines not being perfectly regular, but imperfectly representing different geometrical figures, as irregular parallelograms, rhomboids, triangles, etc. This series of lines were much narrower than the deeper ones first described, and undoubtedly lie in the anterior portion of the cornea, so it is believed they were probably in Bowman's membrane. Additional evidence of their position was given by the appearance of a number of small but distinct spots of cloudiness here and there about the same level, and above these the epithelium became more rough and a larger surface involved; with direct illumination the lines and spots appeared black, but with indirect illumination and the use of the loupe they appeared grayish. It was thought at times that some of the lines and dots were translucent. The epithelium was so roughened that it was impossible to determine whether or not it was elevated at the site of each of the larger punctate spots.

The cornea was now partially anæsthetic, it being the thirteenth day since the operation. The membrane had entirely disappeared from the left eye, but was still forming in the right. Treatment was continued for several days along the lines mentioned, before the membrane entirely disappeared, the cornea becoming slowly more hazy all the time. The eye was now covered with a watch crystal for a couple of days, but the latter seemed to produce so much irritation of the skin by retaining the moisture, without, so far as could be seen, being of any benefit to the cornea, that it was removed and protective goggles substituted. The whole cornea and a part of the conjunctiva immediately surrounding it were now anæsthetic, and the former still roughened and partially abraded and quite hazy. The pupil dilated only moderately under atropine and the intraocular tension was always normal.

It was about this time that Dr. G. E. de Schweinitz, who had seen the patient with me some days before, suggested the possibility of thyroid extract being of some use. Its administration was therefore begun, and whether on account of the medicament or as a coincidence I do not know, but from the second day of its administration the eye began to improve. Within seventy-two hours after the first dose the corneal sensation had partially returned and the cornea had become much clearer. The patient, who was markedly neurotic, had also grown more cheerful and her general expression was better. She was now sent to her home in the country, under the care of her trained nurse, with the hope that the familiar surroundings, together with the fresh air, would help her neurotic condition and incidentally the eye. Unfortunately she was of such a temperament that she could not be persuaded to do anything she did not wish to do, and though we could not get her out-of-doors every day, the eye continued to improve, and in a few weeks there was noticeable only a slight nebulous-like haze in the lower inner quadrant of the cornea, no peeling of the corneal epithelium, and normal vision.

An examination made three weeks ago showed a slight haziness about 3½ mm. in diameter near the centre of the lower inner quadrant out of the line of direct vision. The lattice-like appearance of the superficial lines could still be observed, the deeper lines having entirely disappeared, and over the nebulous portion there was still partial anæsthesia of the cornea.

In 1890, Biber[1] described a form of bullous keratitis following superficial abrasions of the corneal epithelium occurring some time after an injury that usually recurred for a long time with slight inflammatory symptoms, but finally ended in permanent recovery with but little if any corneal opacity.

In the same paper he describes a variety of keratitis which he has termed "lattice-like," in which there have been numerous fine lines in the superficial portions of the cornea, crossing each other so as to resemble lattice work, accompanied by many small opaque spots, at the site of each of which the epithelium was elevated, the latter being also more or less roughened, and later abraded and anæsthetic. It was usually found in several members of the same family, affecting both eyes, and terminated badly as regards the integrity of the cornea and vision. Cases of this character have also been recently reported by Haab[2] and Dimmer.[3]

There has also been described a condition in which numerous lines crossed each other in the deeper layers of the cornea, forming a sort of panel figure, and which were first supposed to be due to dilated lymph channels or infiltration of large nerve canals, but were afterward found

[1] Biber. Inaug. Dissert., Zurich, 1890.
[2] Haab. Die gitterige keratitis. Zeitschrift für Augenheilk., September, 1899.
[3] Dimmer. Ueber oberflächliche gitterige Hornhauttrübung. Zeitschrift für Augenheilk., October, 1899.

to be due to a folding of Decemet's membrane (Hess, Schirmer) on account of a shrinking of the corneal tissue in cicatrization or to its unequal swelling in infiltration.

The case which I report seems to have possessed the symptoms of all three of these conditions. Whether they were produced in my case by some injury to the corneal epithelium or by injury to some portion of the trigeminus it is impossible to say, though a careful study of the manner in which the symptoms presented themselves and the later progress of the case would seem to indicate the latter. Whether there was direct injury to some portion of the fifth nerve, or whether the corneal condition was produced by an irritation, is another interesting question impossible to determine.

The literature of the pathology of trophic keratitis has been recently reviewed by Harlan,[1] from whom I quote the following:

"The corneal lesions which follow section of the fifth nerve, or its paralysis from other cause, were formerly attributed to the loss of the trophic influence of this nerve, but since Snellen and Buttner reported that in their experiments on rabbits these lesions did not occur if the eye was protected, they have been quite generally attributed, at least in the text-books, to loss of sensation of the cornea and its consequent injury by external irritants. Numberless clinical cases have been recorded, and we have all met with such, which would prove this contention most satisfactorily if there were not others which, if less numerous, are equally positive on the other side of the question, and can be better explained by recourse to the older theory. They are too numerous also to be set aside as exceptions, and I have seen enough of them myself to make me quite sure, while still in doubt as to the true pathology of the disease, that the mechanical theory is insufficient."

My own case seems to belong to that class in which the mechanical theory must be excluded, because the anæsthesia did not present itself until some time after the corneal disease had been established; in addition, instead of securing improvement of the corneal disease by protection, for example, with the bandage, and later with the watch crystal, the condition gradually became worse. I am, therefore, inclined to the belief that the affection was produced by some disturbance of the trophic nerves of the cornea; but the question as to whether there is a special set of trophic nerves, or whether it is a part of the function of the trigeminus to exert trophic influence over the cornea, and also as to whether the lesion was irritative or paralytic, must remain undetermined.

[1] Harlan, George C. Trophic Keratitis, etc. Trans. Amer. Ophthal. Soc., 1897, p. 107.

CLINICAL STUDY OF THE OCULAR SYMPTOMS FOUND IN SO-CALLED POSTERIOR SPINAL SCLEROSIS.[1]

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The following broad generalizations of the ocular symptomatology found in so-called posterior spinal sclerosis (a disease according to the newest teachings dependent upon an atrophy or degeneration of the sensory neurones, followed by sclerosis, though most probably antedated by varying degrees of low-grade inflammation) are the results of a series of most carefully applied studies extending over a period of more than five years. Much of the clinical work has been obtained from the services of the two great hospitals with which I am connected. Every case studied, now amounting to more than one hundred properly made uncomplicated diagnoses, has been submitted to a routine examination embracing every detail of relevant value, while several have been carried to the post-mortem room and the microscope table for further examination as to the histological and pathological changes in the ocular structures.

Given in this way, as a brief *résumé* of the entire work, and a crystallization of the whole, as it were, the subject-matter may be fairly assumed as having some weight in scientific medicine and of being of working value to the clinician. As such it is offered.

Recognizing, even from the ocular stand-point, the broadness of the subject and its many ways of approach, the main and most salient points have been robbed of all detail, dyscrasic differences have been eschewed, and everything that has been considered worthy of notice has been given in a few brief words of description.

Realizing from an extensive clinical study the great primary divisions of the disease into a very badly termed preataxic and an ataxic stage —better an initiative (or probably inflammatory) and a degenerative stage—the separation of the subject-matter into two great clinical subdivisions (cerebral), "optic type"[2] and the spinal type, which latter many neurologists subdivide into the lumbodorsal and the cervical, is offered merely for sake of convenience and greater ease of comprehension, reserving for a later and more extended paper upon the different phases of the subject the minute divisions and special ramifications of the disease in its etiological and histological bearings to a number of

[1] Read before the American Ophthalmological Society at the Fifth Triennial Congress of American Physicians and Surgeons, May, 1900.

[2] By some classed among the cervical groupings.

more specialized articles which will appear from time to time as experimental work may accumulate and pathological material warrant.

The gross "optic type," appearing in about 10 to 15 per cent. of the total number of cases (the average age in my series having been forty-two years and the male sex predominating by 90 per cent.) is at first shown by fair if not normal vision. This is followed, without the appearance of any gross general symptoms or even pupillary changes in the majority of cases, by a whole series of visual paræsthesias and somewhat irregularly contracted fields of vision for white, with markedly diminished ones for color. In association they are frequently slightly marked, though undeniably present, spastic movements of the extra-ocular muscle series, combined with both normal and even exaggerated deep reflexes as particularly seen in the patellar tendon groupings. In this stage, in the majority of cases,[1] the tissues of the optic nerve-head will be found somewhat swollen; the edges of the disk will appear slightly hazed; the retinal arteries, especially in the syphilitic types of the disease, will exhibit perivascular change; the retinal veins will be more or less tortuous; and slight disturbances in the choroid will be manifest.

Sooner or later this grouping of irritative and inflammatory signs will be followed by symptoms of degeneration, each case being complicated with an intervening stage of apparent betterment of both the objective and the subjective conditions, lasting for varying periods of time, and dependent in most instances upon the grade of the disease, hygiene, and therapy.

The disease not kept in abeyance, atrophic processes in the optic nerves gradually and with only too great certainty take place. The optic nerve-head substance becomes intensely greenish-gray in tint, particularly in its temporal half. Its general capillarity lessens, the nerve-head borders again become visible, its surface sinks smoothly and quite evenly, exposing the cribriform plate in some instances, while the retinal and choroidal tissues about its edges appear somewhat thinned and degenerate.

If perivasculitis has been present the lymph-channel walls remain both thickened and opaque, while the vascular lumens are frequently encroached upon and diminished in calibre. If there has not been any perivascular change, the blood-streams, particularly the arterial, become narrowed and offer but slight contrast in tint to that of the contiguous structures.

Vision for both form and color, which may have induced false hopes

[1] Unfortunately, this stage will be the one that is most infrequently seen, unless every case of ophthalmic disorder presented to the clinician in which an ophthalmoscopic study can be made is submitted to routine methods of examination, as has been constantly done by the writer.

for permanent betterment by having arisen to varying degrees of acuity, saturation, and kind—and even in some instances to what is ordinarily supposed to be normal—gradually decrease until at last all light-perception is gone.

The visual fields having broadened in a few cases, and in quite a number of instances having shown a fair amount of color saturation, again contract, as a rule, most irregularly without the presence of any scotomatous areas until sector after sector of the retained portions are removed and naught but absolute blindness remains—a blindness which though terrible in itself seems in some instances to limit and even lessen many of the gross motor signs, and prevents the occurrence of the horrible visceral crises which make the lives of some of the cases frightful even to contemplate.

During this stage, the preataxic, as it is improperly called by many, and at times even rather early in it, some of the well-known pupillary, ciliary, and extraocular muscle signs become manifest in at least 30 to 50 per cent. of the cases. Both temporary and permanent failures of iridic reaction to light impulse (80 per cent.), with frequently uncontracted oval and ovoid pupils; commencing inability of continuance of forced lateral monocular and binocular fixation, with tremulousness of palpebral movement; doubtful slight pareses of convergence, and paretic diplopias of various kinds are among the prominent motor signs present.

Later, after the most variable of periods, though unfortunately only too frequently quite early in the course of the disease, without the appearance of many of the ordinary gross general expressions of the condition, the completed ocular picture of absolutely irremediable total blindness in the two eyes generally appears. The aimless gaze, the contracted pupil, the failure of the iris light-reflex, the increasingly uncertain movements of the iris to accommodative and convergent efforts, the extraocular pareses, with palpebral fissure narrowing, even the epiphora in a few instances, and the not rare spontaneous twitchings of the sympathetic fibres of the orbicularis muscles during both forced and ordinarily imperfect action, are offered the ophthalmic clinician as some of the main and most important ocular guides[1] for the diagnosis of the disorder.

The other type of the disease, "the spinal," in which the classic symptoms of paræsthesia, in the trunk and upper and lower extremities, lancinating pains, enfeeblement of the muscular and temperature senses, rapid fatigue, inability to walk backward, loss of manual dexterity, etc., followed by lessening and loss of the main deep and superficial reflexes, inco-ordinations of the most bizarre types, and crises (often

[1] Hypotony, in some instances most doubtful, was found in but 15 per cent. of the cases studied.

barometric in type) of the most excruciatingly painful and serious character, seldom finds its way into the ophthalmic dispensary. In consequence, this form of the disorder is not so frequently seen by the ophthalmologist unless he have the wards of a large general hospital or the out-door practice of a special hospital for nervous diseases at his command.

For long periods of time, in spite of coarse objective appearances of the optic nerve-head, good and even normal vision in fairly large form, though markedly decreased, color-fields of irregular and slightly indented shapes in the great majority of instances are found. Miotic pupils, often pin-point in size, with intermittent losses of light-reaction, until at last the irides remain absolutely fixed to the strongest and the most prolonged light-stimulus,[1] are common. Early ataxias of all kinds, connected with the sixth, the third, the fourth, the fifth, and the seventh pairs of nerves, quite irregular in character (even to the slightest asthenopias, and uncertain pareses of accommodation), very variable in degree, and markedly interchangeable, seem at times even to usher in the main clinical aspects of the disease, while minor expressions of optic nerve-head and adjacent retinal change, such as very slight greenish-gray discoloration of the tissues of the optic disk, shallow and broad cuppings of the disk-substance back to the lamina cribrosa (which is very frequently visible), and a diminution of the retinal circulation without perivasculitis or retinal hemorrhage, represent the most pronounced findings with the ophthalmoscope. In fact, in spite of all these symptoms it seems that there is an absence of all gross inflammatory signs in the ocular structures, even in association with the coarsest general disturbances of the disease, such as dystrophies and the grossest trophic disorders.

These objective and subjective signs, both constantly and intermittently progressive and markedly interrelated, express their presence upon a sensory functioning power at first during exposure to feeble external stimuli, until at last nothing but small peripheral areas of light-perception in the lower temporal fields constitute the last visual expressions of physiological action, and exhibit their influences upon an unstable and variable motor apparatus that finally becomes fixed and at times all but useless.

[1] The so-called sympathetic skin-reflex of the iris—a most uncertain sign to obtain in this class of subject—was undoubtedly absent at times in some of the cases.

NOTES ON DIABETES.

By James B. Herrick, M.D.,
of Chicago.

1. On Casts in the Urine During Diabetic Coma.

A small amount of albumin and a few casts are not uncommon in the urine of many, according to some of most, cases of diabetes mellitus. Cardiovascular changes or uræmic symptoms may give evidence of a true chronic diffuse or interstitial nephritis, and explain the persistence of albumin and casts. During or just preceding diabetic coma, however, casts may suddenly appear in such extraordinary numbers as to deserve mention. E. Külz[1] and Aldehoff[2] were the first to notice this phenomenon. Sandmeyer made a report on it in 1891 to the Tenth Congress of Internal Medicine. Mering,[3] Rumpf,[4] Nebelthau[5] and Williamson confirmed it. It had been previously noticed that in some cases of diabetic coma casts were present, but it was apparently regarded as accidental. Since my attention was called to this phenomenon by reading Williamson's[6] work I have seen it in all of three cases where I have sought for it. If the urine obtained as coma approaches be allowed to stand for a few hours, a light, hazy, grayish or slightly yellowish sediment will be seen at the bottom of the sediment glass, rising, perhaps, to one-sixth the height of the urine. The same sediment is, of course, obtainable by means of the centrifuge. This sediment will be found to consist almost entirely of short, broad, light-colored, finely granular casts. There is no relation between the amount of albumin and the number of these casts. In several cases Williamson watched the urine carefully for days before the onset of the coma, but no deposit was seen until just before the symptoms of coma commenced. The casts may appear twenty-four hours in advance of coma, and thus give warning of its approach. In cases of coma with recovery casts have been known to make their appearance with the manifestations of coma, and have disappeared as the symptoms have vanished. Aldehoff[7] has seen them appear within three hours in the urine of a diabetic who returned from a fatiguing walk, with a rapid pulse, oppression in the chest, labored, deep breathing—in short, what seemed to Aldehoff as

[1] C. Külz. Inaug. Dis. Marburg, 1895, reports ten cases of E. Külz's in which this phenomenon was observed.
[2] Aldehoff, in Külz's Klinische Erfahrungen über Diabetes Mellitus, Jena, 1899, p. 458.
[3] Ibid.
[4] Rumpf. Ueber Diabetes Mellitus. Berl. klin. Woch., 1895, No. 31.
[5] Nebelthau. Berliner klinische Wochenschrift, 1896, No. 34.
[6] Williamson. Diabetes Mellitus and its Treatment. Edinburgh, 1898, pp. 178 and 286.
[7] Aldehoff. Loc. cit.

threatening coma. The urine contained numerous "coma-casts." The urine, passed three hours before, had been free from such casts. The patient recovered and the casts disappeared.

The cases I have examined were as follows:

Case I.—A man, aged sixty-five years, seen with Dr. Wynekoop. He had not consulted a physician for years until a few days before, when he had gone to Dr. Wynekoop, who found sugar, the first knowledge of the existence of diabetes. Questioning, however, revealed the fact that the subjective symptoms of diabetes dated back for more than a year. When I saw him coma was advancing. Urine was obtained by the catheter, and showed in addition to the ordinary findings of the urine of diabetic coma the sediment of finely granular casts above described. In this case, a large drop of urine being examined with a low power and no cover-glass being used, they were seen piled against and across one another like sticks in a loose wood-pile. There was but a trace of albumin. Death occurred in less than twenty-four hours after the specimen was obtained.

Case II.—An old lady, aged eighty-four years, whose husband had died of diabetes seven years before, consulted me because of sleeplessness and mental depression. There were thirst, weakness, and furuncles. Sugar was abundant in the urine. Three weeks later a fatal coma developed. Enormous numbers of granular and hyaline casts were present as in the previous case; albumin was but slight in amount.

Case III.—In a case seen with Dr. Pigall, a woman, aged about sixty years, who had been told three years before that she had sugar in the urine, became dull, dyspnœic, had several convulsions, followed by coma and death. There was no paralysis. The urine was loaded with sugar and albumin and contained very large numbers of casts. This may be an instance of uræmic coma or a mixture of the uræmic and diabetic.

This phenomenon may, as Aldehoff and Williamson claim, be of value in the early diagnosis of coma. With suspicious symptoms it might well be a confirmatory test, and it might enable the physician by early treatment to secure at least a temporary recovery. Naunyn, while admitting the presence of casts during coma, is rather skeptical regarding their occurrence in the enormous numbers Külz described, and especially as to their frequent appearance in the prodromal stage.[1] Even though later investigation may show that in other forms of coma there may be similar casts the value in the early recognition of diabetic coma is not lessened. Upon just what pathological condition it depends is unknown. It is possible or even probable that the kidneys during coma are overpowered by the attempt to eliminate some toxic substance, be it acetone, diacetic acid, or oxybutyric acid, and that there are rapid changes in the kidneys such as have been noted by many observers, especially the fatty degeneration and the alterations in the loop of Henle, and that because of these renal changes cylindruria results. As

[1] Naunyn. Diabetes Mellitus, p. 293. Nothnagel's System.

Rumpf expresses it, there is a destruction of the secreting epithelium that in the elimination of the toxic products of tissue-change suddenly gives way.

2. On the Occasional Low Specific Gravity of Saccharine Diabetic Urine.

The specific gravity of the urine in diabetes generally rises with the amount of urine and the percentage of sugar. So true is this that, given the specific gravity and the amount of urine, approximate quantitative estimation of the sugar can be made by empirically constructed tables. Yet the specific gravity of the sugar-containing urine may be so influenced that it is lowered below the average of saccharine urine or even that of normal urine. A close study of cases of diabetes shows that at times diabetics may pass urine that contains sugar and that has a specific gravity as low as 1020 or much less. This does not include the polyuria with low specific gravity that sometimes precedes diabetic glycosuria or persists during convalescence and after sugar has disappeared. Polyuria may occur because of the development of a chronic interstitial nephritis, in which case the urine will show albumin and casts, but at the same time contain sugar and be of lower specific gravity. In fact, some go so far as to say that when in diabetes mellitus the specific gravity falls below 1020 one should always suspect the beginning of an interstitial nephritis. In these cases the sugar later may be reduced to a minimum or entirely disappear.

On April 26, 1900, I examined a man, aged fifty-four years, with a typical history of thirst, excessive appetite, emaciation, weakness, polyuria, and glycosuria. He was then on diabetic treatment by his physician. His total urine for twenty-four hours was 1500 c.c., specific gravity 1012. It contained a trace of sugar, albumin, and a few granular casts. There was beginning consolidation of the right apex. Here the nephritis apparently lowered the specific gravity.

Strümpell says that in those who are very weak the specific gravity may fall below 1020.

The drinking of large amounts of water or other fluid may lower the specific gravity in a marked manner. A patient of mine, aged fifty-eight years, with well-marked diabetes, drank large quantities daily of a mineral water of supposed curative properties. The specific gravity of the urine for days was never over 1019 and was often 1015 to 1018, yet the test for sugar was always strongly positive. Another patient, a fleshy man, aged fifty-five years, under observation for nearly a year, with typical manifestations of diabetes of the obese adult type, came into my office one day partially intoxicated and soon asked for a urinal. He passed about twenty-four ounces of urine, which I immediately tested for sugar. There was a prompt reaction. The specific gravity of the

specimen tested by different urinometers, and by another physician as well as myself, was 1004. The patient had been drinking beer with some friends all the morning, an explanation of the intoxication, the polyuria, and the low specific gravity.

On looking up the subject I find that even lower specific gravities than this are reported as occasionally met with. Of 224 cases in one of Külz's series, twenty-seven, or 12 per cent., showed at times a specific gravity of less than 1010. In one case it was as low as 1003. Eichhorst says that once in a while a specific gravity as low as 1008 or 1002 is seen. The latter case is perhaps the one Waterman reported in the *New York Medical Record* in 1882. Naunyn found a specific gravity of 1003 in spite of over 1 per cent. of sugar. And many other cases with occasional specific gravities below 1010 are reported. The lesson is, therefore, plain that the only safe way is to examine every urine for sugar, even when the specific gravity is low. One patient may be in the incipient stage of a complicating chronic nephritis, may be weak and debilitated, or may have been consuming large amounts of liquids, any one of which circumstances may tend to lower the specific gravity of the sugar-containing urine. And the importance of this fact to the life insurance examiner needs no elucidation. That some companies to-day only require the examiner to test for sugar when the specific gravity is above 1020 or perhaps 1015 shows that the occasional occurrence of saccharine urine of low specific gravity is not as generally recognized as it should be.

PNEUMONIC COMPLICATIONS IN PULMONARY PHTHISIS.[1]

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Ever since the lungs of phthisical patients have been examined by pathologists the variety of lesions observed has made a great impression on all careful investigators. The variety is such that almost by itself the question arises whether all these different lesions could really be produced by one and the same disease, or whether several diseases working together were at the bottom of them.

This question found different answers by different observers, and a very heated scientific discussion arose over the question of the "unity" or "dualism" in the phthisical process. The most important exponent of the doctrine of the unity of tuberculosis was the great French clinician and anatomist, Laennec, whereas Virchow differentiated strictly between the tuberculum proper and the more diffuse caseous pneumonia.

[1] Paper read at the thirtieth annual meeting of the Medical Society of the State of California, at San Francisco, April 17, 1900.

The question seemed to find a solution when, in 1882, Koch discovered that in all tuberculous lesions it was possible to find the same one organism, the tubercle bacillus, but Koch himself doubted whether this one organism alone could produce the great variety of lesions which we find in the phthisical lungs, and suggested that in its destructive work in that organ it might be frequently assisted by other pathogenic bacteria; and a number of his pupils, among whom I should like to mention Spengler especially, have endeavored to ascertain how far in the production of the pulmonary lesions the tubercle bacilli themselves were concerned, and how far they were the result of a mixed infection with the tubercle bacilli and other pathogenic bacteria. In 1891, Orth made a special study of the pneumonic complications in pulmonary phthisis, and he came to the conclusion that the tubercle bacillus could produce in a general way, but especially in the lungs, two forms of lesions—one of them of nodular appearance, the tuberculum proper; the other a more diffuse pneumonic process with consecutive caseation, the so-called caseous pneumonia. The question how far in the production of these caseous pneumonias mixed infection was concerned he left in doubt, but he expressed his belief that the tubercle bacillus alone could produce at least certain forms of them, because in a number of cases he had searched for other bacteria and found none. The question was then taken up in 1893 by Ortner, who came to the opposite result, and claimed that the pneumonic complications of phthisis were due in all instances to mixed infection, although in a few of his cases he himself was not able to demonstrate any other bacteria besides the tubercle bacilli; but soon afterward, in 1894, Fränkel and Troje were able to prove that such an extreme view was not supported by the facts. They demonstrated conclusively that there are at least certain forms of caseous pneumonia in which at the post-mortem we do not find any other bacteria but the tubercle bacilli, and which, therefore, appear to be the result of a simple, not of a mixed infection. But these authors in their turn seem to have gone to an extreme in giving too little importance altogether to the mixed infections which undoubtedly occur quite often. In 1895, Professor Orth, in Göttingen, suggested to me to make further investigations in this direction, and since that time I have been interested in this important question. Part of the material used for the present paper was collected in Göttingen, and I desire to express my sincerest gratitude to Professor Orth for allowing me to make use of the same, and also for many valuable hints in regard to the method of investigation pursued; the other part of the material has been collected since I came to San Francisco.

In this necessarily short introduction I have mentioned only a few of the most important papers, and could therefore not do justice to a host of careful investigators who have treated the subject from one stand-

point or another; but I hope to give a more detailed historical review in a more extensive paper on the same subject to be published later.

When we try to approach our subject systematically the first question to be answered would be, Where does the infectious material that causes the pneumonic complications come from? There seems to be hardly any doubt that in most instances this infectious matter is furnished by the pulmonary cavities, at least all observers agree that in the vast majority of cases in which we find pneumonic complications we also find cavities containing such matter as would be apt to produce them when carried into healthy portions of the pulmonary tissue. Since the larger cavities are almost invariably in direct communication with the bronchial tubes, and thus with the air, they usually do not contain tubercle bacilli in pure culture, but other micro-organisms besides, sometimes saprophytes, but mostly pathogenic forms. Of the latter the following have been met with: staphylococcus pyogenes aureus and albus, streptococcus pyogenes, pneumococcus, micrococcus tetragenus, Friedländer's pneumobacillus, influenza bacillus, colon bacilli, diphtheria and pseudodiphtheria bacilli.

I myself have examined twenty-six cavities in thirteen cases. I found a pure culture of tubercle bacilli in seven of these twenty-six cavities; the others contained a mixture of tubercle bacilli and other bacteria. The species encountered were the following: streptococcus pyogenes in one case; pseudo-diphtheria bacilli in five cases; pneumococci in six cases; pneumococci and pseudo-diphtheria bacilli in four cases; staphylococci and streptococci in two cases; pneumococci and staphylococci in one case.

The infectious material is carried from the cavities to other parts of the lung by what is commonly called aspiration. The process in reality often is not so much of an aspiration as a gravitating downward of the infectious material in the bronchial tubes. Whether a pneumonic process is set up by such an aspiration depends largely on the number, the variety, and the virulence of the bacteria present in the material aspirated.

The point to which the infectious matter is carried also plays an important rôle. Pneumonic complications will naturally arise only when the material is carried at least as far as the infundibula.

In those cases in which the cavities are not surrounded by a continuous membrane of granulation and scar tissue the pathogenic organisms may enter adjoining healthy portions of the lung directly from the cavities, without travelling first through the bronchial tubes.

In all I have examined the lungs of fifty-six phthisical patients with regard to pneumonic complications, and among thirty-seven successive cases I have been able to find pneumonic complications in twenty-five instances. Of course, it is entirely impossible to examine every part

of a phthisical lung minutely, so I am ready to acknowledge that in some cases smaller pneumonic patches may have escaped my attention. The lesions that I have found have naturally not been of the same character in different parts of the same lung, and so the number of specimens actually examined has been much larger than the number of cases. The results of my examinations have been, shortly, the following:

In the first place I am able to confirm the statement made first by Orth, and later corroborated by Fränkel and Troje, namely, that there is one form of pneumonic process met with in tuberculous lungs which seems to be produced by a simple infection with tubercle bacilli. At least when we examine these pneumonic patches after the death of the individual we do not encounter any other bacteria in them. What makes it even more probable that they are the results of a simple infection with tubercle bacilli is the fact that these lesions exhibit histological characteristics by which they differ considerably from that form of bronchopneumonia which arises from a mixed infection. We can distinguish between different forms of this true tubercular pneumonia. The first one we might call the acute type. In it we find a central caseous area surrounded by air spaces filled with fibrin, epithelioid cells, and lymphocytes. The more peripheral air spaces usually contain desquamated epithelium, a few lymphocytes, œdema, or a little fibrin. The septa do not seem to participate actively in the process at all. The capillaries are often hyperæmic; occasionally there are hemorrhages. Of such acute cases I have seen eleven examples, of which nine contained tubercle bacilli in pure culture; in the other two, cultures made from the affected spots contained a few pus cocci; but in spite of careful search for them they could not be found in sections, and were therefore most likely derived not from the diseased area itself, but accidentally gathered from cut small bronchial tubes. In the more chronic cases we find between the exudate and the caseous area a layer of tuberculous granulation tissue which pushes its way more or less far into the adjoining air spaces. The granulation tissue sometimes contains giant cells. The septa are either normal or show a moderate degree of infiltration with lymphocytes, and only rarely are they appreciatively thickened by the development of granulation tissue in them. Such more chronic tuberculous lesions were found eighteen times, and in all cases they did not contain any other bacteria but tubercle bacilli. The most chronic forms are those in which the tuberculous granulation tissue has a tendency to become transformed into a simple granulation tissue, in which, therefore, the tubercular process becomes a simple carnification —in other words, shows a tendency to heal. This I have seen twice.

Between these three forms of true tubercular pneumonia we naturally find all transitional stages, since essentially the process is one and the same, and differs only quantitatively, so that in a given specimen

it may be difficult to classify the lesion among one of these three groups.

The acuteness of the process seems to depend to a certain extent on the number of tubercle bacilli present in the diseased spot, so that in the cases with many tubercle bacilli the lesions had an acute character. But this correspondence between the acuteness of the lesion and the number of tubercle bacilli is not complete. The virulence of the bacilli and the condition of the patient therefore also seem to exercise an important influence upon the amount and character of the reaction in the tissues.

Here I should like to mention shortly an objection that has been raised by Baumgarten against Orth, namely, whether the processes just described were really rightly called tuberculous *pneumonia*. Baumgarten, and with him Troje, claims that inasmuch as in them we observe the appearance of epithelioid cells in the air spaces and in the more chronic forms, even of a more or less typical tuberculous granulation tissue, they do not differ materially in their structure from ordinary tubercles, as we find them in miliary tuberculosis of the lungs or other organs, the only point of difference being that in these cases the tubercular tissue develops inside of the air spaces. But Baumgarten and his followers seem to overlook entirely that with the presence of the epithelioid cells, etc., we have in the tubercular pneumonias an inflammatory exudation which is best shown by the constant presence of a very large amount of fibrin in the lesions—a fact which was first duly emphasized by Orth. It is true that fibrin has been found in miliary tubercles also (Falk), but only in a very small quantity. Now, it seems that it is a general principle in pathology that "a potiori fit denominatio." These lesions, therefore, are rightly classified among the pneumonic processes, whether the exudate contains epithelioid cells or not; otherwise one might just as well object to calling a chronic abscess an abscess because the pus in it contains a certain number of fibroblasts.

Such an area of tuberculous pneumonia may become the seat of a secondary infection with other pathogenic bacteria by way of the bronchial tubes; and then the bacteria, mostly pus cocci, seem to find a soil very suitable for their development in the caseated matter, and in developing in it they seem to add very considerably toward its rapid disintegration. This corresponds well with the results of some animal experiments made by Prudden, who was able to produce cavities in the lungs of tuberculous animals by injecting pure cultures of pus cocci into their bronchial tubes, causing in that way a secondary infection of the tuberculous areas in them.

But although secondary infections favor the rapid disintegration of the caseous material, and with that the formation of cavities, they are

by no means necessary to this end. I have frequently seen evidence of a breaking down of caseous material without secondary infection. In these latter cases I have never missed finding a very large number of tubercle bacilli in the disintegrating material.

The extent of the lesion, whether it affects only small portions of a lobe or whether it involves an entire lobe, or even an entire lung, depends, of course, entirely on the amount of material aspirated and the way it is accidentally distributed in the pulmonary tissue.

There remains one question of great clinical interest, namely, What is the ultimate outcome of these tuberculous pneumonias? In most cases the local outcome seems very unfavorable in that they lead to rapid caseation and disintegration of the pulmonary tissue. The rapidity of the process varies, of course, with the more acute or more chronic character of the process, but the few specimens in which we find little caseation and a transition of tuberculous into simple granulation tissue seem to prove that sometimes even these forms of tuberculosis may exhibit marked tendency toward healing.

In other forms of pneumonic complications we have mixed infections from the beginning. In these cases other pathogenic bacteria are carried simultaneously with the tubercle bacilli into the healthy parts of the lungs. Here also we can distinguish between more acute and more chronic forms. The acute forms present to the naked eye entirely the aspect of ordinary bronchopneumonias, and do not differ materially from them in their microscopical structure. In these first stages of the process caseation may not be present. In some cases they betray their at least partly tubercular nature by the presence of epithelioid cells in the exudate. In the more chronic cases of mixed infections we find either a very marked tendency to rapid caseation or disintegration, or, on the contrary, the process may also end in carnification.

Among sixteen cases of mixed infection there were nine cases of acute bronchopneumonia without caseation; four cases with apparently very rapid and extensive caseation, and four cases with carnification. The bacteria, found together with the tubercle bacilli, were the following: Pneumococci, ten cases; streptococci, one case; pneumococci and streptococci, one case; pseudodiphtheria bacilli, one case; pseudodiphtheria bacilli and streptococci, one case; cocci of unknown nature, in one case.

In one case, which histologically had all the characteristics of an acute mixed infection, I was unable to find any bacteria besides a few tubercle bacilli. The only explanation that I can offer in this case is the supposition that other bacteria had been present, but were already overcome and destroyed at the time of the post-mortem.

It is interesting to note that the only two cases in which there was an infection with pseudodiphtheria bacilli there also was carnification.

Besides these two outcomes caseation on the one hand and carnifica-

tion on the other, there seems to be one other of which it is not possible to obtain anatomical proof. It is very likely, and seems to be supported by clinical evidence also, that not rarely the acute pneumonic process set up by a mixed infection heals. Clinically the recovery may be and often is complete, but the presence of tubercle bacilli in these lesions makes it very probable that anatomically the process will not heal completely, but with a remaining more or less extensive simple tubercular lesion.

Ordinary lobular and lobar pneumonias naturally may occur in the course of phthisis, but they do not seem to be frequent. At least among my cases I have been able to find only two cases of bronchopneumonia and one case of lobar pneumonia in which no tubercle bacilli could be discovered in the exudate. It has often been asserted that such simple pneumonic complications could be secondarily infected with tubercle bacilli, but as far as I see it has not been possible to furnish an anatomical proof for such an assertion.

There is also the possibility that acute mixed infections may in course of time assume the character of a simple tubercular pneumonia after all other bacteria except the tubercle bacilli have been destroyed in them. In view of the case in which the lesions showed the histological characteristics of a mixed infection, and nevertheless did not contain any other bacteria but tubercle bacilli, I think that such may be the case; and when we consider that cavities rarely contain a pure culture of tubercle bacilli, whereas simple tubercular pneumonias are met with quite often, we might argue that such an occurrence is perhaps more frequent than we are inclined to believe, when we judge merely from the anatomical and bacteriological findings at the post-mortem.

When we try to get a correct idea of the general importance of the pneumonic complications in phthisis, all forms included, it becomes of importance to note how frequently they are met with, and, from an anatomical stand-point especially, how frequently they are the immediate cause of death. As I have mentioned above, I have found pneumonic complications among thirty-seven successive cases twenty-five times, showing that, at least in the later stages of the disease, they occur most frequently, and I am sure that in most of these cases the pneumonic complications were the direct cause of death. Frequently they seem to be accompanied with acute generalized infections with the bacteria that are associated with the tubercle bacilli in causing them. At least among seven cases of acute mixed infections in which I have records of a bacteriological examination of other organs, there are five with more or less complete generalization of the infection. In one of them there existed a general infection with the pneumococci, in another a general infection with Friedländer's bacilli. In two of the cases pneumococci were found in the lungs and liver, and in one pseudodiphtheria bacilli also in lungs and liver.

These generalized infections, which undoubtedly belong to the terminal infections that are so commonly observed in chronic wasting diseases, may arise, though, in cases of phthisis in which there are no pneumonic complications. Among twenty-seven cases of uncomplicated tuberculosis of the lungs I had terminal general streptococcus infection three times, general staphylococcus infection once, and in seven more cases pus cocci, apparently absorbed from the lungs were found in one or the other organ, mostly in liver or spleen. These cases illustrate that there may be a direct absorption of the pus cocci from the pulmonary cavities into the blood-current without mixed infections of the nature of pneumonic complications.

Last of all the question arises, Is it possible to diagnose the presence of a mixed infection in the lungs clinically by bacterial examination of the sputum.

Kitasato, under Koch's direction, has worked out a method by which he claims it is possible to obtain the material contained in the pulmonary cavities free from the admixtures it receives in passing through the bronchi, trachea, larynx, pharynx, and mouth while it is expectorated. The process consists in a repeated washing of the sputum in sterilized water. Even if the process was perfectly safe, which is disclaimed by some authors, the only thing that we could achieve by the method would be to find out whether pulmonary cavities contain other bacteria in addition to the tubercle bacilli. That, of course, does not necessarily imply that there is really a mixed infection, because these pathogenic bacteria can live in the cavities without necessarily penetrating into the surrounding tissues, which latter only would constitute an infection.

That this is not merely a theoretical construction, but an actual fact, is borne out by my personal observation. In seven cases I could find pathogenic bacteria other than the tubercle bacilli in the cavities, and no acute mixed infections in any part of the lungs. It is possible that I have overlooked small areas of mixed infection in a few cases, but hardly in all of them, because I have paid especially close attention to them. But although, therefore, the presence of pneumococci, streptococci, or other bacteria in the washed sputum does not prove conclusively the presence of a mixed infection, I do not deny absolutely the clinical importance of the method, but it ought to be used only with the understanding that a positive finding makes a mixed infection more or less probable but not certain.

That the results at which I have arrived from the study of my cases is not only a personal one and produced by conditions such as they exist in certain localities only where I happened to make my examinations, is proved by the fact that, in his excellent work, which is based on a minute study of twenty-one cases, Professor Sata, who has recently studied the same question under Ziegler's direction at Freiburg, arrives

at essentially the same conclusions. There are only a few points in which my observations are at variance with those of Professor Sata. In the first place, he does not seem to have found pure cultures of tubercle bacilli so frequently in open cavities as I have. When he finds in his specimens almost exclusively what he calls "mischpneumonie," that is, lesions partly due to tubercle bacilli, partly to infection with other bacteria, whereas, according to my statements, it is not so unusual to find pneumonic lesions in which we find tubercle bacilli only. This apparent discrepancy may be due largely to his not having separated so strictly as I have the results of mixed infection and those of apparently simple infection with tubercle bacilli which often occur in immediate proximity to one another in one and the same specimen. However that may be, we both agree in regard to the main point—*i. e.*, the importance of mixed and secondary infections in the development of the destructive process in phthisical lungs.

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A CASE OF DERMOID CYST OF THE MEDIASTINUM,

WITH REMARKS UPON THE ETIOLOGY AND EMBRYOLOGY, AND A SURVEY OF RECENT CASES.

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A BRIEF pathological account of the following case was published in the *Mount Sinai Hospital Reports*, 1898, vol. i., but a minute description has purposely been delayed in the expectation that another instance of this rare disease might present itself. In this report no cognizance has been taken of differential diagnosis, nor has a detailed account been given of the cases hitherto tabulated by previous writers on the subject. The history of the case follows:

Fanny G., aged thirty years, a native of Russia, was admitted to the hospital on January 24, 1898. Her family history was entirely negative.

She had been married seven years, and was the mother of three children, the youngest of which was five weeks old. She gave no history of any previous acute illness, or of rheumatism, syphilis or tuberculosis. She had never suffered any injury. Ten months before admission she noticed a small swelling on the right side of the chest anteriorly, above the breast, and at the level of the third rib. The swelling was not tender to the touch nor red in color, but it occasionally caused slight pain. The tumor did not increase in size until four months ago, when it began to grow suddenly, and one month ago attained its present size. She had not noticed any glandular swelling or any disturbance in lactation, and had continued to nurse her infant. Aside from the presence of the tumor, she considered herself in perfect health, being free from all febrile disturbance or other symptoms.

Status Præsens. The patient is tolerably well nourished, and a physical examination of the internal organs fails to reveal the presence of any organic disease. Opposite the third rib on the right side of the chest anteriorly is a tumor the size of an orange, the skin over it being freely movable. The mass is evidently adherent to the underlying tissues, and the tissues at its base appear to be somewhat indurated. The tumor is neither tender nor sensitive, and it gives a distinct sense of fluctuation. Aspiration by means of a small trocar reveals the presence of thick, yellowish fluid of a honey-like consistency. There are no physical signs referable to compression of bloodvessels, nerves, or any of the mediastinal contents. Cough and expectoration are absent, and no pulsation of the tumor is noticeable.

Operation. Three days after admission Dr. Gerster decided to explore the tumor, and the patient being anæsthetized by Schleich's mixture No. 3, an incision four inches long was made over the long axis of the mass. The pectoralis major and minor muscles were divided parallel to their fibres, and the cyst was exposed. It was so firmly attached to the pectoralis minor muscle that upon dividing the fibres of the latter, the cyst was ruptured and a thick, brownish fluid containing small particles of gritty matter was evacuated. The wall of the tumor was more widely opened, and there was exposed to view a mutilocular cyst, one small pocket after the other containing a similar fluid. The last pocket incised was found to lead from the thoracic cavity by an extension of the cyst through an opening between the third and fourth costal cartilages. More fluid welled up through this opening, which was found, on probing, to lead deeply into the thorax. Through the enlarged opening, by means of a scoop, a considerable amount of thick fluid, gritty, calcareous matter and strands of hair were removed from the intrathoracic portion of the cyst. In order to expose the latter, two inches of the thirb rib near its costal end were resected. The patient was turned upon her side and the contents of the cyst thoroughly washed out. This exposed to view a large cavity occupying nearly the entire anterior mediastinum, the cyst wall being attached to the pericardium, diaphragm, and right pleura. The extra-thoracic portion of the cyst wall was dissected away, several large drainage-tubes were introduced into the cavity, and the wound was packed with gauze.

During the division of the intercostal muscles the right pleural cavity was accidentally opened, on account of the dense adhesions, and to avoid any possible subsequent involvement this opening was carefully sutured and two inches of the ninth rib in the posterior axillary line

were resected, and a drainage-tube was inserted. After the operation the patient's temperature was 102.4° F., pulse 120, and the respirations 50. Her general condition was fair.

For the next four days a profuse discharge from the wound necessitated a frequent change of dressings and irrigation of the cavity. On the fifth day signs of consolidation appeared over the base of the right lung, and the temperature rose to 103.4° F., pulse 100 to 128, respirations 28 to 36.

February 2d. The cyst cavity still contains much fluid and detritus. Pulsation of the heart can distinctly be seen along the median line as well as the rising and falling of the diaphragm with each respiration. Dulness, bronchial voice and breathing, and extensive râles are still present over the right lower lobe. The provisional drainage-tube that had been inserted in the ninth intercostal space has been removed, and the pleural opening is healing. The patient's general condition is decidedly worse.

10th. Although signs of resolution have been present for four days, and the temperature is now 100.6° to 102° F., the patient's condition has not improved. The urine to-day contains a trace of albumin.

13th. On account of the difficulty in keeping the cavity properly drained, a siphon arrangement for continuous irrigation is applied. The morning temperature is now 99.6° F., and the evening temperature is 102.2° F., and the patient is suffering from pronounced toxæmia, with marked cerebral excitement and involuntary evacuations.

25th. The cyst cavity is growing smaller in size, and the discharge is of a more solid consistency.

March 9th. The patient is rapidly emaciating, and an extensive bedsore has developed. The mental condition is unchanged.

17th. The patient has failed slowly, and died at 9 o'clock A.M.

Post-mortem Examination. The body was examined fourteen hours after death. Marked emaciation and a moderate amount of rigor mortis are present. In the second intercostal space on the right side of the sternum is an oblique incision 5 cm. long, leading to a cavity about 8 cm. x 6 cm. in size, bounded by the pleura covering the inner surface of the right lung, and by the pericardium. The wall of this cavity varies from 4 mm. to 1 cm. in thickness, is of a firm, fibrous nature, and is more or less covered by fatty, granular detritus, in which are seen numerous bits of light-colored hair. Here and there are several firm polypoid excrescences springing from the cyst wall, and varying in size from a bean to a large walnut. These are also covered with fine, short hairs. The sac wall is firmly attached to the lung, from which it cannot be separated. A section made through the wall at this site shows that it is firmly united to the parenchyma of the lung, and several minute fibrous septa seem to extend slightly into the pulmonary tissue which appears somewhat compressed at this point. The outer surface of the cyst wall is also attached to the large vessels in the mediastinum by fibrous bands. Several smaller cysts presenting the same general characteristics are seen springing from the large cyst. In one of these is a large polypus measuring 3 cm. x 2 cm.

The lungs are slightly œdematous, and a few pleural adhesions are present on both sides. The heart presents a slight dilatation of the right auricle and a moderate concentric hypertrophy of the left ventricle. The liver is congested and somewhat fatty. The spleen is moderately enlarged, amyloid in character, and presents a slight increase

in the amount of its connective tissue stroma. A few small hemorrhagic areas are also seen. All of the other organs examined appear normal. No trace of thymus gland can be found.

Microscopical Examination. Specimens from various parts of the cyst wall were hardened, cut, and stained, and the following appearances noted.

The cyst wall is firmly united to the pericardium, pleura, and diaphragm by dense fibrous connective tissue. This is especially marked at its connection with the pleura, where no definite demarcation is observed, and small offshoots of fibrous tissue can be seen entering the pulmonary tissue proper. At this situation the substance of the lung shows evidence of compression. Beneath this dense fibrous layer is a fine loose meshwork of connective tissue rich in bloodvessels. Many of the smaller arteries show a marked obliterating endarteritis, and here and there are small areas of round-celled infiltration principally about the bloodvessels. A layer rich in cells and vessels is next seen, and it is in this portion of the wall that the skin elements are found. These elements consist of numerous hairs, many of which appear as regularly formed as in normal skin; others again show marked cystic dilatation at their roots. In addition to this, several small bundles of smooth muscle fibre, seemingly, from their size and position with reference to the hairs, erector pili muscles, were observed. Sebaceous glands are present in the greatest abundance, and in most situations are perfectly normal in their general appearance and formation. Only a very few sudoriferous glands are encountered. It is upon the surface of the polypoid excrescences described above that the skin formation is most plainly noted. Here, also, are large portions of adipose tissue. In a few places are small areas of mucous glands with a connective tissue matrix between the alveoli, and their lumen filled with mucin. In one situation a group of spherical vesicles, each vesicle being lined with a single layer of columnar epithelial cells, with oval nuclei, is seen. These vesicles are filled with homogeneous contents that take the usual staining reaction for colloid, and so closely resemble thyroid glandular tissue that any distinction is impossible. Here and there, on the free margin of the cyst wall, are small patches of stratified epithelium, and upon all of the nipple-like polypi the epithelial cells take the distinct appearance of the rete Malpighii, and are covered with the usual corneal layer of the epidermis. In some places the surface of the cyst wall is necrotic, the cells do not take the stain well, and a granular appearance is noted. No attempt at a formation of bone tissue is observed in any of the sections, nor is any ciliated epithelium present, but in some of the sections, mainly in those cut through the polypoid excrescences, several areas of cartilage cells are seen.

Remarks. Dermoid cysts of the mediastinum are of such rare occurrence that a glance at the literature of the subject may not be amiss. Hare[1] has collected 520 cases of mediastinal tumors in his monograph, and of this number but eleven were dermoid cysts. In 1800 autopsies made at the Brompton Hospital, mentioned by Fowler and Godlee,[2] thirty cases of mediastinal tumor were found without a single instance of dermoid cyst. Hoffmann[3] has searched the literature on the subject since the year 1825, and has been able to collect but fourteen cases. He suggests dividing these tumors into three classes:

1. True dermoids.
2. Dermoids containing cartilage and cylindrical cells.
3. Dermoids combined with lymphoid tumor.

That a division into these three groups is not a satisfactory classification will presently be shown in discussing the embryology of the subject. In the case just described the cyst was for a time considered to belong to Hoffmann's first group. After making sections from various parts of the cyst walls the presence of cartilage was finally demonstrated. Several authors have reported cases of dermoid cyst in the thoracic cavity, but have failed to mention them as originating in the mediastinum. It is the writer's opinion that in most instances the mediastinum will be found to be the original source of the cyst.

Pflanz[4] has made a more careful search of the literature and has collected a series of twenty-four cases, to which he has added a personal case. The patient was a man, aged twenty-one years, who presented a cyst in the anterior mediastinum below the right clavicle and bulging forward behind the first and second ribs on the right side. The cyst was opened by an operation and drained. It contained hair, fat, and dermoid detritus, and the patient left the hospital with a narrow fistula remaining. The reader is referred to the original article for a careful description of the twenty-four recorded cases.

Ekehorn[5] has reviewed the cases tabulated by Pflanz, and has added to the list five additional cases from the literature and two personal cases. His first case was that of a woman, aged twenty-one years, with a cyst in the lower portion of the right chest attached to the mediastinum. Bone and cartilage were seen, and between some of the small areas of cartilage ganglion cells and nerve fibres were present; ciliated epithelium was also found. The largest single piece of bone was 1½ cm. x 2 cm. in size, from which several teeth protruded. Its whole appearance was similar to a portion of the upper jaw. The second case was a patient of Dr. Fogman's, in Stockholm, who presented a cyst to the left of the heart and attached to the left lung. Two teeth protruded from a polypoid growth in the cyst cavity. The author did not have access to the account of Smythe's case, which he mentions only by title, so I shall insert it here.

Smythe[6] describes the case of an unknown woman, aged thirty years, who died suddenly. The autopsy revealed the presence of a cyst occupying the entire upper lobe of the left lung, and pressing upon the pericardium and mediastinum. The cyst contained dermoid tissue and hair, and in its cavity was found a bony mass weighing eight grammes. The report does not state whether the cyst was a true mediastinal one, but it undoubtedly belongs to this class.

Another case not mentioned by either Pflanz or Ekehorn is that published in 1893 by Kretz.[7] The patient was a man, aged thirty years, in whom the diagnosis of pulmonary tuberculosis and bronchiectasis in

the left upper lobe was made, and who subsequently expectorated bits of hair. At the autopsy tuberculosis of both upper lobes was found. Besides this in the left upper lobe was a cyst the size of an apple, containing hair, fat, and pus, and to its wall a polyp was attached by a pedicle. The cyst wall contained skin, hair, and sebaceous glands, and a perforation into a bronchus was demonstrated. This specimen was examined by Kundrat, who agreed that its origin was the anterior mediastinum.

Since the publication of Ekehorn's paper there has been another case reported by Bergmann.[8] This was a man, aged thirty-eight years, who presented a painful swelling at the junction of the second and third costal cartilages with the sternum on the right side. A fistulous opening was seen, and when this was enlarged by an incision a cyst containing dermoid material, fine hairs, teeth, and polypoid growths was found.

These polypoid or warty excrescences are present in nearly all of the cases, and vary much in general appearance and size. They project into the cyst cavity and are usually supplied with short hairs, most frequently light in color. Occasionally these hairs may be of considerable length. According to Sutton,[9] these polypi may even be genuine mammary glands, and may secrete colostrum. In the author's case the epidermis over these growths was thrown into manifold rugæ, giving a distinct papillary appearance to the sections.

There still remain two cases that have not been included in the previously mentioned lists. Ogle[10] described an interesting case in which the polypoid growths presented an unusual appearance. The patient was a man, aged twenty-eight years, who died as the result of a profuse hæmoptysis. The sputum was offensive, and there were physical signs of an empyema. A diagnosis of bronchiectasis was made. At the autopsy a cyst was found in the lower lobe of the right lung partly in the mediastinum. Its origin was undoubtedly in the mediastinum, whence it invaded the lung, pressing upon a bronchus. The fluid contents looked like blood mixed with pus. Projecting from the wall of the cyst were five or six cream-colored, pear-shaped bodies, " with the rough aspect of skin, resembling the swollen tongue of a corpse," and covered with hair. A large tooth was also found embedded in the wall. The microscopical examination showed stratified epithelium covering fibrous and fatty tissues, and many sebaceous glands and hairs. Inflammatory tissue was present upon the surface.

The other case is the one reported by W. Hale White,[11] of a cyst the size of a large orange attached to the anterior and right surface of the pericardium, and adherent to the right lung. This cyst contained dirty, yellowish fluid, with cholesterin, oil globules, solid sebaceous matter, and some loosely attached hairs.

These cases, together with that of the author's, bring the total number of mediastinal dermoids up to thirty-seven.

The presence of bone, cartilage, mucous glands, smooth muscle fibres, connective tissue, and fat, together with thymus and thyroid elements arising from the mesodermal and entodermal layers, should place many of these cysts in the group of teratomata if a finer distinction is to be attempted. In but two cases have I been able to find thymus gland tissue present. Marchand[12] describes a cyst with two processes extending upward along the trachea to the thyroid gland, containing thymus tissue and Hassal's corpuscles, and Pinders[13] also describes lymphoid cells and thymus tissue in the first of his two cases.

Thyroid tissue has been described only by Waldeyer,[14] who reports a cyst occupying the lower half of the right chest with a pedicle extending upward to the thyroid gland. This pedicle contained bloodvessels and thyroid tissue. In my case, as described above, there were small vesicles lined with columnar epithelium, which must be considered thyroid gland. Of Hoffmann's third group, dermoids combined with lymphoid tumor, there is but one recorded instance. Pinders describes a cyst occupying the anterior mediastinum from the first to the fifth rib, which contained dermoid elements, and was combined with lymphosarcoma. Metastases were found in the left lung.

The thick, honey-like contents discovered by aspiration in our case has been described by Löwenmeyer,[15] who reports the case of a man dying with severe signs of dyspnœa. The left chest was filled with a tumor mass, tightly adherent to the pericardium and diaphragm. Virchow studied this tumor, and found it to be a mixed type of growth, containing spindle and giant cells in parts, elsewhere distinctly striated muscle fibres (myoma striocellulare), and multilocular cysts containing thick, honey-like fluid. The lining of the cysts was partly epidermis and partly ciliated epithelium. Some structures resembled embryonal lung tissue, other parts showed tissue of a carcinomatous nature. This case must then be classed with the teratomata or with this variety associated with malignant tumor.

Belonging to this class is also the case of cystosarcoma of the lung arising from a mediastinal dermoid reported by Jores.[16]

Etiology and Embryology. For a better comprehension of the etiology of dermoid cysts of the anterior mediastinum it is necessary to glance at the embryology of the branchial clefts, and of the thymus and thyroid glands, from which these cysts are believed to originate. According to Born[17] and Hertwig[18] the thymus gland is derived from the entodermal lining of the third gill-cleft. In his earlier writings His[19] described its origin from the ectoderm of the cervical sinus; but three years later he published an article in which he withdrew his former opinion and agreed with the observations first made by Born. Some writers suggest that the thyroid gland may be an etiological factor in the production of these cysts. Remak, in 1855, first described the origin of the thyroid from the entoderm of the pharynx, but it required

the combined work of Wölfler,[20] Born and others to show that the median and lateral portions were derived from the floor of the pharynx between the first and second branchial arches, and from the entoderm of the fourth gill-cleft respectively. According to Minot,[21] as soon as the gill-clefts become open passages the line of demarcation between ectodermal and entodermal lining cannot be distinguished on account of the intimate fusion of their respective cells.

It is known that the third branchial arch may dip downward over the fourth branchial arch, and becoming united to the side of the pharynx, enclose a part of the precervical sinus, forming a small closed pocket lined with ectoderm. The buried furrow of the third cleft lies in close proximity with the thymus gland, and if from some exciting cause or irritation a growth or proliferation originates in this epithelial remnant it is easily seen that by its extension downward into the thorax a cyst may be formed. This will explain many of the simple dermoid cysts, not, however, those containing elements from all of the three embryonal layers. According to Wilms,[22] teratomata may arise from a single sexual cell by a displacement or separation of tissue (monogerminal implantation); or they may be due to the inclusion of a rudimentary twin (bigerminal implantation). Wilms has concluded to classify many of the dermoid cysts of the ovary and testicle representing all three of the germinal layers with the rudimentary parasites originating from a single sexual cell, and not as a result of the inclusion of a rudimentary twin.

Ekehorn, stating that whereas double monsters are not uncommonly seen, due to abdominal inclusions, and that union of twins by the chest (thoracopagus) also occurs, believes that, in order to explain the multiplicity of tissues found in some dermoid cysts, we must consider them to be formed by the process of bigerminal implantation, one of the twins remaining as a rudimentary undeveloped embryo. This is certainly a most convenient theory upon which to base our observations concerning those cysts that contain tissues from all of the embryonal layers. That these dermoids should consequently be classified with the teratomata is beyond question, and therefore I would suggest the following division:

1. True dermoids containing only ectodermal structures.
2. Teratomata, or dermoids with the addition of structures from the entoderm and mesoderm.
3. True dermoids or teratomata, with the addition of tumor formation.

This classification, I believe, fulfils all demands made by the histological findings in the cases in the literature more satisfactorily than Hoffmann's division of these rare growths, and is the result of my study of every reported case. It will serve, too, as a basis for grouping future cases since it is founded on the histological evidence of all published dermoid cysts of the mediastinum.

For the privilege of publishing this case, and for the courtesy in fur-

nishing the clinical data, I am indebted to Dr. A. G. Gerster, attending surgeon to the hospital.

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A CRITICAL SUMMARY OF THE LITERATURE

ON THE

SERUM DIAGNOSIS OF TUBERCULOSIS.

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DEMONSTRATION of the presence of tubercle bacilli constitutes practically certain proof of the existence of tuberculosis, but unfortunately tubercle bacilli are often absent from secretions in just the period in which diagnosis is most important, and the disease is frequently so situated that the bacilli do not gain access to secretions that may be examined. Reaction to tuberculin, while almost absolute as an indication of the existence of tuberculosis, is unfortunately a very uncomfortable method for the patient, and one which the majority of the profession still fear to use. While there is no real evidence that such fears are justified, patients are likely to rebel against the discomfort of a reaction to tuberculin, and it is scarcely probable that this method will ever be very freely used outside of hospitals, as tact in the retention of cases will often interfere even when the procedure would be otherwise advantageous Under these circumstances a method that entails no special distress to the patient, and yet may be considered to give reasonably constant and reliable results, is extremely desirable, and such a method was

suggested by the successful use of the Widal reaction in the diagnosis of typhoid fever. Serious stumbling-blocks in the use of this method in tuberculosis lie in the fact that the tubercle bacilli in ordinary cultures are not homogeneously distributed throughout the culture medium, and are not motile. Hence, cessation of motility and clumping of the bacilli cannot be demonstrated, and upon these phenomena depends the recognition of the occurrence of a reaction. It has been shown, however, that in some cultures tubercle bacilli exhibit active movement—whether this is merely corpuscular or is a voluntary movement is unknown—and it is likewise recognized that frequent agitation of liquid cultures of tubercle bacilli will result in a fairly homogeneous distribution of the bacilli throughout the culture medium.

Arloing and Courmont have prepared cultures which they state can be used with success in the serum diagnosis of tuberculosis, and the results claimed by them are so encouraging that the method seems to deserve further investigation than has been accorded it, particularly since the work of other investigators has given striking confirmation of the conclusions reached by Arloing and Courmont. The number of men who have interested themselves in the matter is small, however, the reason for this being evident when one learns of the difficulties attendant upon the preparation of proper cultures and to a lesser extent associated with the performance of the test. A much more extended use of the method is therefore necessary before its value can be determined. The difficulties are, nevertheless, not insuperable, and the subject is so important that its worth should be definitely settled.

The several publications of Arloing and Courmont cover in part the same ground and may be considered together. They emphasize the difficulty in obtaining homogeneous cultures even under favorable circumstances. All cultures cannot be made homogeneous. The method to be followed is the use of the classical glycerin peptone bouillon as a medium, inoculating this with a bacillus which has been grown in the laboratory for a long time and has become decidedly attenuated. The one they have used produced only glandular lesions in guinea-pigs, and did not cause death. A most important point in order to secure homogeneity of the culture is daily agitation. Reinoculations should be made about once a month, using always identically the same culture medium and the same amount of mother culture; the latter should always be of the same age. The new generations become more and more unlike the original ones. The medium becomes cloudy, and microscopical examination shows that the bacilli are almost entirely isolated, though to a slight extent collected in small masses. They show marked morphological changes and variations in staining; they will often grow on ordinary gelatin or bouillon without glycerin; they produce a uniform creamy-white veil on glycerin-agar, and in the liquid medium develop motility which ultimately becomes very marked. Were the successive

generations not known one could scarcely recognize them as tubercle bacilli. If they are not agitated, however, but left to grow undisturbed they gradually reacquire their ordinary morphological and tinctural characteristics, and form cultures of the usual appearance. Months of patient effort are required to develop a properly homogeneous and motile culture.

When the test is to be carried out one should use a rich culture eight to twelve days old; if the culture is more than two weeks old the reaction is usually unsatisfactory. The technique is more difficult than in carrying out the reaction with typhoid serum. One should take only the upper portion of the culture, as the lower part usually contains small masses of bacilli. The blood from the patient should be drawn into small tubes, and the serum may then be obtained by allowing the clot to retract spontaneously or by centrifugation. The tubes and the finger from which the blood is drawn should be well sterilized before the puncture. Reaction does not occur with normal serum in a dilution of as much as 1 to 5, and in tubercular subjects it rarely occurs in dilutions greater than 1 to 20. Hence, we should mix in small tubes proportions of serum and culture of 1 to 5, 1 to 10, and 1 to 20. After this the tubes should be kept inclined at an angle of about 45°, and examined after two, ten, and twenty-four hours. Subsequent changes have no significance. If reaction occurs one observes with the naked eye more or less complete clarification of the mixture, and a deposit of small flakes along the lower edge of the tube, and microscopically one sees that the bacilli have formed clumps and are no longer motile. The macroscopical examination is facilitated by holding the tube over a black surface; in the microscopical examination it is important to handle the tubes gently, as the clumps are easily broken up.

Dubard seems to be the only one besides Arloing and Courmont who has prepared cultures of his own. The value of the reaction has been investigated by Mongour and Buard and by Bendix, but they obtained their cultures from Arloing and Courmont. Dubard used Ferran's method, and obtained cultures with characteristics closely corresponding to those described by Arloing and Courmont.

The clinical results reported by the originators of the method concern examinations of 186 persons. Of these 128 gave a positive reaction, while 58 were negative; 96 of the positive cases were known to be tuberculous, or proved to be so; 10 of the negative cases were also definitely known to have tuberculosis—a fact which would appear at once to speak strongly against the value of the test were it not that they were all advanced cases, and that in the use of tuberculin it is well known that frequently no reaction occurs in advanced cases, because there is already excessive intoxication with tuberculin; and the animal experiments of Arloing and Courmont, which will be quoted, showed that very virulent or severe infections give no serum reaction. The two methods of diag-

nosis are therefore alike as to this point, but it does not reduce the value of either as a diagnostic measure, as diagnosis in such cases is practically always easy. If these cases are excluded from the statistics, Arloing and Courmont had 100 per cent. of positive reactions in cases known to be tuberculous. In affections considered to be other than tuberculosis they had 26 positive reactions in 60 cases; 9 of these, who were subsequently examined at autopsy, showed the presence of tuberculosis; it had not been suspected by the clinician in any of the cases. Twenty apparently healthy persons were examined, and six gave the reaction. There was no opportunity for determining whether these six subsequently showed tuberculosis or not. The authors compare these results with those of Beck, whose statistics concerning the diagnostic use of tuberculin are the largest extant, and decide justly, so far as their figures go, that their method gives about the same results as tuberculin, and that each method proves the value of the other.

Mongour and Buard first recorded four cases of pleurisy, nine of pulmonary tuberculosis, and seventeen cases with various affections. Of the cases of pleurisy, three which were certainly tuberculous were positive, the other, which proved to be not tuberculous, was negative. The cases of phthisis were all positive; in one the clinical diagnosis was in doubt, but autopsy showed a tuberculous cavity. The seventeen other cases gave very interesting results. They included instances of rheumatism, epilepsy, hæmoptysis, and various other affections. In all but two the result of the reaction corresponded with the subsequent clinical course or with the conditions found at autopsy, and in some of them the positive reaction led to careful physical examination and the discovery of tuberculosis, which had previously been entirely unsuspected. For example, in a case of chronic rheumatism that had been under observation for six years with no symptoms suggesting tuberculosis, examination after a positive reaction led to the discovery of râles in the apices and of tubercle bacilli in the sputum. The two cases which showed discrepancies between the reaction and the post-mortem findings were not of much importance, as the post-mortems were incomplete. The same authors later record twenty-five further observations with results which were similarly favorable to the test, but which cannot readily be summarized. They state that the microscopical observation of the cessation of motility is more satisfactory than the macroscopical test. They consider the test accurate and easy of practice when proper cultures are once at hand.

Correspondingly favorable results are reported by Bendix—normal persons not giving the reaction in dilutions as low as 1 to 3, and persons with diseases other than tuberculosis not responding, while thirty-four of the thirty-six cases with tuberculosis gave distinct reaction, the negative cases being instances of virulent infection. This experience, therefore, corresponds to that of Arloing and Courmont. Besides these

investigations of blood serum, Courmont has carried out the reaction with the fluid from fourteen cases of pleurisy with effusion, eight of ascites, one of effusion in the knee-joint, and one of meningeal exudate. In eighteen cases the effusion was due to tuberculous disease, and in only one instance did the fluid fail to give a reaction. The non-tuberculous cases were all negative.

So far, then, as clinical investigations have been carried, all are strongly in favor of the value of the test, except those of Dubard. This author states that he considers the test of relatively little value, but his report is not clear as to details, and it is impossible to determine definitely his reasons for the statement.

A fact which early impressed itself upon Arloing and Courmont was that there were occasionally rather curious results—that repeatedly persons who had such mild grades of tuberculosis that the disease was scarcely discoverable clinically gave reaction in high dilution, while others who were severely ill reacted only in low dilutions or not at all. Arloing and Courmont investigated the reason for this by choosing animals of different species and different degrees of natural immunity to tuberculosis and inoculating them with bacilli of different degrees of virulence and with material from different tuberculous lesions. They learned that it is possible to produce agglutination in the blood serum in all animals investigated, and that the agglutinating power may be developed by different methods of inoculation and by different forms of cultures. But there are definite variations in the readiness with which the agglutination appears. The agglutinating power varies enormously in the first place in proportion to the virulence of the cultures or material inoculated. Weak cultures, for instance, always produce a marked agglutinating power in the dog, guinea-pig, and rabbit, while virulent cultures produced much less marked agglutinating power or none at all. In the cow and goat reaction was obtained after injecting virulent cultures, but the highest reaction was obtainable with the attenuated cultures. In general, the animals reacted in the following series: the dog best, next the rabbit and the goat, then the cow and the guinea-pig. It was evident that the variations in agglutinating power after inoculations depend chiefly upon the resistance of the species to tuberculosis. The guinea-pig, which is most subject to tuberculosis, is also the animal in which agglutinating action is least readily produced, and in general it shows the lowest power of agglutination. On the contrary, the goat, which is very refractory, shows agglutination even after injection of very virulent cultures. The dog, which is moderately susceptible, does not show agglutination after virulent infection, but shows a very high agglutinative power when suffering from mild tuberculosis. The intensity and frequency of agglutination is, therefore, in inverse relation to the virulence of infection and in direct relation to the resistance of the animal infected. There may be other factors which affect the reac-

tion, as the manner of introduction of the infective material, the primary locations of the lesions, associated infections, and the like. There is also to be noted an interesting variation in the rapidity with which the agglutinating power appears. The latter may prove to be of importance in drawing conclusions from the serum diagnosis.

These results indicate that one may expect, in human subjects, that poorly marked reactions or none at all will be seen in those who are suffering from a very severe or virulent infection, and perhaps in those who are excessively susceptible. Experimental work on animals, therefore, gives results entirely similar to those obtained by Arloing and Courmont in working on human subjects, and the same inverse relation between the intensity of infection and the strength of the reaction has been observed by all other workers. It is suggested by Arloing and Courmont that in human subjects as well as in animals it may be demonstrated that agglutination takes place more readily when the bacilli used in the test are homologous to those causing the infection—a very interesting idea and one that may prove very important if the test ever comes to be of decided clinical value.

A review of all this work leads one to conclude that whatever the clinical value of the method may prove to be it deserves to be tested more widely. Undoubtedly the preparation for the work requires a great deal of care and patience, and disheartening failures are likely to be met with in accustoming one's self to the work, particularly in the preparation of proper cultures. This is seen in the fact that all those who have investigated the method, excepting Dubard, have used the culture originally prepared by Arloing and Courmont, and we are led to suspect that others have made ineffectual attempts to prepare satisfactory cultures. But the method would be of enormous value if its general use could be secured and if results proved satisfactory. It requires a laboratory and a skilled bacteriologist; but in this country probably this would not lessen its value to any great extent, even to general practitioners without hospital connections, as our health board laboratories could do the work for them. The aid that it would give the profession in general, if it proved a reliable method, is evident, and the importance of the question would seem to demand efforts to determine its value definitely and to put it at the service of the clinician.

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REVIEWS.

PULMONARY TUBERCULOSIS. ITS MODERN PROPHYLAXIS AND THE TREATMENT IN SPECIAL INSTITUTIONS AND AT HOME. Alvarenga Prize Essay of the College of Physicians of Philadelphia for the year 1898, revised and enlarged. By S. A. KNOPF, M.D. (Paris and Bellevue, N. Y.); Physician to the Lung Department of the New York Throat and Nose Hospital: Former Assistant Physician to Professor Dettweiler, Falkenstein Sanatorium, Germany; Vice-President of the Pennsylvania Society for the Prevention of Tuberculosis; Fellow of the American Academy of Medicine; Laureate of the Academy of Medicine of Paris, etc. With descriptions and illustrations of the most important sanatoria of Europe, the United States, and Canada. 8vo. Pp. 332. Philadelphia: P. Blakiston's Son & Co.

THE essay to which the Alvarenga Prize was awarded forms a volume of 332 pages, freely illustrated and containing much material that could with difficulty be found in any other publication, and which is invaluable to one coming much in contact with tuberculous patients. In his introduction, which is a very modest expression of the hopes of the author, the opportunities which have been enjoyed by Dr. Knopf in the study of his subject are briefly mentioned. Few men have had the opportunity and have taken the trouble to investigate the subject of the various sanatoria for tuberculosis in such a thorough manner, and in reading the book one is impressed with the fact that the author is thoroughly familiar with that of which he speaks, and that the statements which are made in regard to the various institutions mentioned are founded upon actual experience by a careful observer. As an instance of the thoroughness with which the author has accomplished his task, mention might be made of the fact that the question of the use of the various sputum-cups is thoroughly discussed and many other supposedly minor matters are carefully considered. The same care is taken in regard to all of the apparently slight hygienic details. This precision and thoroughness are noticeable throughout the whole book, and make one of its most valuable features.

There are so many prominent questions at the present time in regard to tuberculosis that it is interesting to see what views are held by a man who has made a particular study of this infection. In Chapter V. the question of registration of tuberculous patients is discussed, and, while the author evidently is himself in favor of the compulsory notification of tuberculosis to the municipal authorities, he considers that the time is not ripe for any statutory action to be taken. With this I think the vast majority of general practitioners, as well as the less radical of the tuberculosis specialists, will agree. Directions for limiting the spread

of tuberculosis in the absence of notification are given with a completeness seldom seen. The author lays particular stress upon the danger of the propagation of the disease through infection of the railroad cars carrying patients to the various health resorts. This danger is undoubtedly one that should not be lightly treated either in regard to tuberculosis or to any of the other major infections. It would seem as though in the progress of sanitary science some further preventive measures should be made compulsory when we consider that it is perfectly possible for a diphtheria patient to travel for two consecutive days and nights in a Pullman sleeping car, suffering from a virulent attack of diphtheria, without any attempt being made to protect those afterward occupying the same berth from contracting the disease. Such an instance has come under the reviewer's notice within the last few weeks. Of course, it is impracticable to enforce disinfection of sleeping cars after each journey; nevertheless, it would seem that disinfection with formaldehyde at intervals would prevent the accumulation of poisonous materials such as can be presumably taking place in the stuffy sleeping cars as at present arranged The statement by the author, that directions have recently been issued for disinfecting the Pullman cars is one that must be gratifying to physicians. Of course, the importance of this is especially great where large numbers of patients suffering from one infection are repeatedly occupying the cars running to a particular point, as is the case with tuberculosis.

The question of the presence of bovine tuberculosis and of measures that have been, are being, or could be taken to prevent its extension is well discussed.

One of the most valuable features of the book is a description of the most important sanatoria and special hospitals for the treatment of consumption in Europe and in America. While it would be desirable for all of us to have been able personally to inspect the various health resorts and sanatoria to which we recommend our patients to go, such a personal knowledge is impossible to most of us, and we all must feel at times as though our directions to patients in regard to changes of climate (the most expensive prescription ordered by us) was made without a sufficiently accurate knowledge of the various ingredients of our prescription. The details given by Dr. Knopf will lessen this feeling to some degree, as in his description of the various sanatoria details as to the surroundings, character of the buildings, and internal arrangements are given with great care.

The use of the pneumatic cabinet, hydrotherapy, and of selection of diet are well considered. Symptomatic treatment receives careful consideration. The lately introduced morphine derivative—heroin—is strongly recommended. This would agree with the experience of most of us that in this drug we have a valuable symptomatic remedy with fewer disadvantages than any of its predecessors. Another point that is of interest in this section of the book is that the author recommends the use of counter-irritants. It seems to the reviewer that in the praiseworthy seeking after rational methods of treatment some of the older methods are being too completely abandoned. Among these undoubtedly should be reckoned the use of counter-irritation. How it acts we of course do not know, and we may never know, yet undoubtedly the application of small blisters, or what is preferred by Dr. Knopf, igni-

puncture, not only is capable of relieving discomfort and of quieting various symptoms, but also appears to be capable of delaying, stopping, or favorably influencing the pathological processes going on beneath. In the treatment of hemorrhage from the lungs ergot is strongly recommended, as is also gallic acid. Whether the first of these has a beneficial influence, a deleterious influence, or no influence at all, is a question upon which there is little accord. It would seem that if ergot does not do good in pulmonary hemorrhage it must certainly do harm, and it seems to the reviewer that there is ample evidence of its having the latter effect. The use of gallic acid in pulmonary hemorrhage probably could not do harm; it is difficult to see how it could do any good. One of the most important questions at the present time is the use of tuberculin as a diagnostic means. While there are many whose opinion is of value who use and recommend the use of this means of diagnosis, the reviewer has always felt that while it was of great advantage to have such a means of diagnosis of tuberculosis in the lower animals, its use in the human subject was not justifiable. Knopf holds the same view, and also is emphatic in condemning the use of any of the so-called curative sera. He has, however, employed with apparent good result antistreptococcic serum to combat secondary infection.

The impression made on reading Dr. Knopf's book is that the outlook for tuberculous patients is far more favorable than is generally believed. Not that the curability of tuberculosis is not generally recognized by the profession, but that most of us have hitherto not realized that we have at our command at the present time so many well conducted sanatoria and special hospitals, and not only so, but that the results of treatment at these sanatoria are so excellent.

On reading the book one feels that he is getting the views of an impartial observer carefully seeking after the truth, and its careful perusal is strongly advised, not only to those particularly interested in the study of tuberculosis, but to the general practitioner, who, after all, is the one who first sees the patient and upon whom rests the responsibility of its early diagnosis and its proper treatment. A word should be said in regard to the awarding of the prize to this essay. At the present time bacteriology and the study of the action of micro-organisms upon the human body is such an attractive field that many would hesitate to offer for a prize an essay dealing with subjects other than these. That the prize committee should honor such a book as that before us is an evidence that practical medicine and treatment are not being too much forgotten in the commendable search after the causes and more minute results of disease. F. A. P.

RAYNAUD'S DISEASE: ITS HISTORY, CAUSES, SYMPTOMS, MORBID RELATIONS, PATHOLOGY, AND TREATMENT. By THOMAS K. MONRO, M.A., M.D. Glasgow: James Maclehose & Sons, 1899.

RAYNAUD'S disease has become quite generally known in recent years, though no English monograph of importance has previously been written. The disease was first described by Maurice Raynaud in

his Inaugural Thesis, published in 1862, but was not very generally recognized even by medical authorities until the appearance of his "New Researches," published in the *Archives Générales de Médecine*, 1874. Between these two publications Raynaud contributed an article on "Gangrene," in the *Nouveau Dictionnaire de Méd. et de Chir. Pratiques*, in 1872, in which he reviewed quite thoroughly the subject-matter of his previous thesis, and quoted very largely from it. In his thesis, Raynaud collected cases of obscure and spontaneous gangrene reported in the literature, and called attention to the fact that though numerous cases had been reported of gangrene following infections and other diseases, a variety could be distinguished by its involvement of the extremities, the nose and ears, by its symmetrical distribution, by the absence of disease of the bloodvessels, and he suggested that the fundamental cause is a disturbed innervation of the capillary vessels. The occurrence of spontaneous gangrene under the influences of nervous disturbances had indeed been recognized by Zambaco in an article published in 1857 under the title "De la Gangrène Spontanée produite par perturbation nerveuse," and Raynaud did not fail to give credit to this author. Zambaco, however, had not recognized the essential features in Raynaud's disease, and his previous publication does not in any way affect the merit of Raynaud's work. Raynaud recognized three stages in the disease or clinical syndrome described by him. In the first stage the affected parts, usually the same finger or fingers of either hand, become white and cold from contraction of the capillary bloodvessels. To this stage he applied the term "local syncope." Subsequently he recognized and admitted that the larger vessels also share in the spasm. In the second stage of the disease the affected area becomes deeply congested, sometimes dark-purplish in color, the previously depleted area now being engorged. The temperature, at first normal, sinks as the stasis increases in duration. To this stage he gave the name of "local asphyxia." Finally, in the third stage, dry gangrene develops, and the phalanx or a whole finger or the tip of the nose or ear may be lost. In the record of the earliest case, that reported by Lachmund in 1676, it is stated that Bernhard Shrader, a student of surgery, travelling with companions in 1629, learned of a case in the person of a daughter of his host at a small inn. The girl had suffered with considerable pain in her fingers and toes, and in the tips of her ears and nose, and there had been swelling of the affected parts, followed by mortification and dropping off of little pieces without any signs of decomposition. The father of the patient showed Shrader a box in which he had stored away during three years one hundred or more small pieces of the tissue that had fallen off. The three main features—syncope, asphyxia, and gangrene—and the symmetrical occurrence of the involvements mark Raynaud's disease as a distinct type. Later investigations into the etiology have added comparatively little to the facts brought out by Raynaud himself. The effect of cold in developing the condition in the beginning and in determining subsequent attacks is recognized now as it was by him. Constitutional conditions, especially neurotic affections, undoubtedly stand second in importance, and certain other diseases, like malaria, gout, syphilis, and diseases of the generative organs, especially in women, must be ranked as important influences. The disease is more common in the female sex, and is favored by exposure and emotional disturb-

ances. The author of the work under review has collected 180 cases, and finds that of the 145 recorded in English, French, and German periodicals, 81 per cent. are in journals in the English language. Considering that it is probable that these figures exaggerate the differences in liability of different nations, the author took the names appearing in the bibliography and found that British authors constitute 44 per cent., while 59 per cent. of all wrote in the English language.

The recognition or diagnosis of Raynaud's disease requires a preliminary determination of the features which characterize this disease. Local vascular disturbances sometimes terminating in necrosis or gangrene are met with in several conditions, including frost-bite, ergotism, senility, atheroma, diabetes, hysteria, and peripheral neuritis, and the vascular phenomena without gangrene may be simulated by congenital cyanosis, cardiac disease, and erythromelalgia. In none of these conditions, however, are the three peculiar stages, the paroxysmal character, and the symmetrical involvement noticed. Further, however, it is necessary to recognize that Raynaud's disease does not invariably present the three stages, some cases terminating with the stage of syncope, others advancing to asphyxia, the rest increasing to the stage of gangrene. In a table comprising 176 cases, Monro found three cases with local syncope only; twenty cases with syncope and local cyanosis, and sixty-six cases in which necrotic or sclerotic processes were added to the local syncope, and generally, though not always, after the supervention of the second stage of local cyanosis. In twenty-eight cases local cyanosis alone was observed, and in fifty-six cases necrotic changes or sclerosis of the tissues followed the cyanosis without a previous stage of syncope. The author, however, has excluded the condition designated as "dead fingers." Undoubtedly this is a phenomenon which may occur in healthy individuals, but Raynaud's disease is also a condition which may occur in otherwise entirely healthy persons. The author very properly recognizes that Raynaud's phenomenon is but an increase of normal condition; a hyperactivity of the normal vasomotor processes—an activity which is set into operation with less marked causes and advances to more serious results than would be the case in the normal person. This being the case, it is clear that every grade of severity of symptoms may be observed, beginning with the normal individual at one end, involving such conditions as dead fingers, tendency to local syncope, etc., and terminating with the most pronounced types of Raynaud's disease.

As a provisional classification of the pathology of the disease, the author gives the following:

Raynaud's Disease:

(*a*) Due to inherited peculiarity.
(*b*) Due to acquired peculiarity.
(*c*) Due to morbid blood state.
(*d*) Part of a wide-spread neurosis (congenital or acquired.)
(*e*) Associated with structural disease of the central nervous system.

Raynaud's Phenomena:

(*a*) Due to a morbid blood state.
(*b*) Due to a concussion or other lesion of the central nervous system.
(*c*) Due to inflammation or other lesion of the nerves.

The author regards the disease as essentially paroxysmal, and excludes cases of non-paroxysmal, rapid multiple gangrene from either the group of Raynaud's disease or Raynaud's phenomena. The classification is satisfactory in so far as it distinguishes between the well-developed disease and the larval forms which are spoken of as instances showing the phenomena, but no practical usefulness is derivable from this or any other classification that has thus far been given. The most important points in the pathology of Raynaud's disease, namely, the exact condition or conditions of the central and peripheral nervous system and the actual conditions of the bloodvessels remain to be settled. Inflammatory and degenerative lesions of the peripheral nerves and changes in the central nervous system have been described, and in some cases it has seemed certain that the nervous lesions have been concerned in the production of the disease. Other equally typical cases have occurred without any such involvement of the nervous system. In either group of cases, vascular changes have been found or have been wanting, so that the actual conditions still remain uncertain, and there may be behind the vascular and nervous changes certain morbid conditions of the blood or tissues not as yet determined.

The review of the literature and the study of the disease as given in Monro's book are eminently satisfactory to the student who wishes a comprehensive discussion of the publications upon this disease, and for the most part the material is presented in a carefully classified way. There has been, however, some perhaps unnecessary repetition under the head of pathology and morbid relations which could have been avoided without detriment to the completeness of the work. A. S.

CLINICAL DIAGNOSIS. THE BACTERIOLOGICAL, CHEMICAL AND MICROSCOPICAL EVIDENCE OF DISEASE. By RUDOLPH V. JAKSCH. Fourth edition. Revised and enlarged by the author from the third English edition of the translation by JAMES CAGNEY, M.A., M.D. London: Charles Griffin & Co., Ltd. Philadelphia: J. B. Lippincott Co., 1899.

VON JAKSCH has himself gone over this edition, owing to Dr. Cagney's death, and has added the new points which seemed important in order to bring it up to the times. Certainly this is the most valuable book in existence for the purposes for which it is intended; it is the most complete, and it has the advantage of being written by an author who has had an enormous personal experience, and has for years had the assistance of a large corps of actively working assistants. The value of the book has been so well demonstrated that it does not need to be insisted upon; it is only necessary to note the degree of thoroughness with which the review has been carried out. So far as the additions are concerned, they may be said to be wholly satisfactory, but the same cannot be said unreservedly of some of the things that have been allowed to remain. It seems to be a rather curious instance of personal obstinacy, as opposed to a real scientific spirit, to persist in calling albumo-

suria peptonuria, and merely to explain that the bodies spoken of as peptones are chemically albumoses. It is also decidedly incorrect to state that the xanthin bases of the urine are best estimated by the process of Krüger and Wulff—a method which is recognizedly untrustworthy and has been wholly replaced by that of Salkowski. These are examples of a few points in the book which are distinctly at variance with what recent work has proved to be correct. Such errors or evidences of personal disagreement with established teaching are not numerous, however. The fact which seems most strikingly evident in going over the new edition is that a wholly complete revision would be a very great improvement. This work has repeatedly been partially revised during a long series of years, but the advances in the methods of clinical laboratory investigation have been so enormous and old methods have been so frequently found to be inefficient that the book as it now stands is too conglomerate a mass of valuable methods, new and old, mixed in with methods and descriptions which are recognizedly worthless and antiquated. This makes it rather interesting than otherwise to one who has already some skill and a good deal of knowledge of the value of the procedures described, but it certainly detracts very largely from its value to the student, or to one who is entering upon the use of clinical laboratory methods, as he frequently finds himself wholly lost in his confused attempt to choose the proper one of the many methods described. The book would be far more valuable if it were completely revised and obsolete methods were either entirely cast out or were stamped as valueless, and retained merely for historical interest; clearer and more direct advice should then be given as to the proper choice of methods for definite purposes. This is all said with a full recognition of the great value of the book as it now stands, and with due honor to the author for having provided the profession with what is probably the most important work of its kind now existing; it is said merely because of personal knowledge that young investigators are oftentimes confused by consulting the work rather than aided in carrying out their purposes. This is apparently due purely to the fact that there is too much of the old mixed with the new, and there is not sufficient clearness in the advice as to the method to be chosen.

D. L. E.

PROGRESS

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MEDICINE.

UNDER THE CHARGE OF

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Obliteration of the Hepatic Vein.—CHIARI (*Wiener klin. Wochenschrift*, 1900, No. 7) reports a case with some unusual features from Pribram's clinic. The patient was a man, aged twenty years, who had frequent attacks of diarrhœa and abdominal pain since childhood. Syphilis could not be traced in the anamnesis. Following the eating of spoiled fruit an acute attack of pain and diarrhœa came on, with distention of the abdomen. Ascites, œdema of the lower extremities, slight icterus, and bilateral hydrothorax ensued; there were multiple hemorrhages, and death occurred from œdema of the lungs. The autopsy showed a liver of normal size. Most of the organ was deep red, the acini unrecognizable. In this part the hepatic veins were thrombosed, their walls thickened. The mouths of the main branches of the hepatic vein were completely occluded in the intrahepatic part of the vena cava, but below that some of the smaller veins were open. Chiari thought the obliteration of the main branches had taken place in early childhood from endophlebitis obliterans, and that the last illness was due to thrombosis of the radicles of the hepatic vein. The cause was probably hereditary syphilis, and the case is much like one reported by Chiari in Ziegler's *Beiträge*, Band xxvi.

Clinically the case was interesting, partly on account of the absence of enlargement of the spleen and liver and the presence of ascites. The possibility of tuberculosis of the peritoneum was suggested by the history of abdominal pain, the family history, the cough, hoarseness, and intestinal hemorrhages. There was also renal hæmaturia. In one case with similar symptoms laparotomy was performed with the idea that there was tuberculosis. In some cases the ascites has been excessive, with rapid reaccumulation after tapping. Pribram looks on the sudden reappearance, after a long interval, of

the abdominal symptoms, with hepatic ascites, as of great significance. At present the diagnosis of hepatic thrombosis cannot be made with certainty, but has to be considered when such symptoms as those mentioned are present.

Angina and Endocarditis.—ROEGER (*Münchener med Wochenschrift*, 1900, No. 8) has analyzed the relations in 120 cases of non-diphtheritic angina, and excluding cases with arthritis. There was no particular relation between the subvarieties of angina in their relation to heart murmurs. Herpetic tonsillitis seemed unusually frequent in this series, being observed in 13 out of 24 cases with heart murmur. In five of the cases there was herpes labialis. Of 10 cases the murmur developed after admission on the second day in 4, on the third in 4, and on the fourth in 2. In nine cases with murmurs on admission, these became louder during the course of the observation. In 5 in which the murmur appeared after admission, it disappeared before the patients were discharged, and in the other 5 persisted after the cessation of other symptoms for from seven to thirty days; on the average, seventeen days. In 14 cases with murmur on admission and a history of palpitation in the beginning of the angina the murmur persisted in 10. The murmur was most distinct at the apex in most cases; in some in the fourth left interspace. All the patients were young (sixteen to thirty years), most of them women; the six male patients were all slender and anæmic. The author concludes from the large proportion of persistent murmurs that there was a genuine endocarditis or valvulitis. In one case the patient was discharged with murmur persisting, and returned five weeks later with increase of the cardiac symptoms, followed by a thrombus in the leg.

Epileptiform Convulsions in the Convalescence of Typhoid Fever.—MÜHLIG (*Münchener med. Wochenschrift*, 1900, No. 7) saw this rare complication in a man, aged twenty-three years, of strong constitution and previously well, and with no history of nervous or mental disease in the family. During the fever the patient slept much and was frequently delirious at night. In the first week of the disease there was a sudden and unexplained fall of temperature, rapidly rising again. On the twentieth day of convalescence, the patient having been in bed all the time, and on soft diet, an epileptiform attack occurred. Clonic spasms began in the outer fingers of the left hand, passed on to the left eyelid, and then became general, lasting half an hour. The pupils were dilated and did not react. Three hours later there was another similar attack, lasting twenty minutes; about five hours later one lasting ten minutes, both coming on in the same manner as the first. Six hours later a final attack appeared and continued, with interruptions of from one to five minutes, an hour. Between the attacks the patient felt comparatively well, but during and after that time he complained for ten days of numbness and formication in the two outer fingers of the left hand. The urine and heart showed no abnormality. The author leaves it open whether there was an embolus or an acute anæmia of the brain.

Actinomycotic Liver Abscess.—LITTEN (*Deutsche med. Wochenschrift*, 1900, No. 4, Ver.-Beilage, 3) reports an interesting case of this kind. A woman, aged thirty-nine years, had vague symptoms for one year, but was able to do

her work up to the time of admission to the hospital. At that time she had marked ascites and a small granulating ulcer at the umbilicus. Examination of the watery secretion of the latter showed many actinomyces, recognizable by the naked eye as small friable granules. A fistulous tract extended an indefinite distance from the ulcer. Just as preparations were being made for drawing off the fluid in order to permit palpation of the abdomen, acute peritonitis developed and soon ended fatally. Autopsy showed that the fistula led up to the liver, ending in an abscess the size of a fist in the right lobe. The liver abscess differed from the usual forms of that disease, inasmuch as the whole liver was converted into a tough sponge-like mass, filled with thick, tenacious pus. The latter contained actinomyces. No sign of the origin of the disease could be discovered. The teeth were carious, but showed no special lesions. There was a small actinomycotic focus in the right ovary.

Cervical Polyarthritis.—Von Jaksch (*Prag. med. Wochenschr*, 1900, Nos. 4 and 7) reports the case of a lad, aged sixteen years, who, from his seventh to his fourteenth year, had annually an attack of rheumatism. In his fifteenth year he noticed that swallowing and all movements of the neck became painful. A tumor formed in the neck, and the mobility of the latter lessened steadily; burning and increasing weakness of the right arm came on, later similar symptoms in the right leg. Examination on admission showed evidences of mitral and tricuspid endocarditis and an inflammation affecting the first three cervical vertebræ. The head was kept immovably inclined to the left and turned to the right. There was a depression in the pharynx, opposite the uvula, dislocation of the upper cervical vertebræ, and a painful fluctuating tumor beside the latter. There was spastic paralysis of the right arm, without reaction of degeneration. There was uncertain gait, the reflexes were increased, with ankle clonus. Hypertrophic pachymeningitis consecutive to caries of the vertebræ was suspected. Later the left arm became paralyzed, sensation was delayed, especially in the left side. Curious reflex spasms set up by the great occipital nerve then began, along with paræsthesia in the hands. Walking became impossible, and slight touching of the head and neck brought on clonic spasms. After a year motion returned in the arms, interrupted in the beginning by periods of paresis. About this time evidences of irritation in the left sympathetic appeared, with left-sided sweating of the face, and dilatation of the pupil and palpebral fissure. Soon after this motion returned in the cervical articulations, with crepitus, the swelling subsided, the paralysis of the arms lessened, and the patient could even stand and walk; the reflexes were less intense. An attack of tonsillitis with fever was followed by increase of the spastic symptoms and the paresis. Herpes appeared in the distribution of the left inferior cervical nerve, and irritation there brought on spasms of the left leg. The condition improved, so that only stiffness of the neck and atrophy of the deltoids remained, but more than two years after the first admission the patient died from rapidly increasing loss of compensation. The autopsy revealed double lesions of the mitral, aortic, and tricuspid valves, with hypertrophy, pericardial adhesion, and secondary alterations of various organs, with anchylosis of the occiput and first three cervical vertebræ, compression of the medulla and descending degeneration of the cord. In the absence of tuberculosis and

gout, and in view of the history, the anchylosis could only be explained by a rheumatic affection.

The Diagnosis of Beginning Tuberculosis by the Sputum.—BRIEGER and NEUFELD (*Deutsche med. Wochenschrift*, 1900, No. 6) emphasize the importance of sputum examinations as part of the early detection of tuberculosis. They properly point out the necessity of special training and practical experience, and the uselessness of a single negative examination. Not only tubercle bacilli, but other bacteria, the possible causes of mixed infection, must be searched for. Moreover, the clinical findings must be carefully worked out, since it is only by the combination of clinical and bacteriological facts that diagnosis and prognosis can be made. The authors also insist on the tuberculin test in all doubtful cases, and, on the ground of the extensive experience of the Institute for Infectious Diseases, assert its safety and certainty. Some interesting case-histories are given in abstract, illustrating the points claimed by the authors. The influenza bacillus and the pneumococcus are among the most important agents in mixed infection, not only in cases with severe symptoms, but also in those with an insidious, even afebrile course. The danger of infecting others in institutions is one that must be borne in mind in connection with such cases. Brieger and Neufeld also suggest that some cases of healed apex catarrh are really cases of pure influenza-bronchitis. Among the cases cited is one of tuberculosis with severe hemorrhages, in which bacilli were not found until three months after admission. The hemorrhages continued, but bacilli persisted in the sputum. Another case is given in which distinct physical signs and tuberculin reaction were present, and yet in over five months' observation tubercle bacilli could not be found. In another case for a long time there were influenza bacilli, but no others.

[The authors' remarks are timely. The idea of mixed infection is taking hold of part of the profession in a way that can only do harm. It is not uncommon to hear of contaminated sputum sent by mail, examined by a pharmacist, and "streptococci" or "staphylococci" found. In the former case antistreptococcus serum is used without reference to the condition of the patient. It must be made clear that the examination for mixed infection requires time and skill, and that even when made the other clinical examination must be properly made and carefully interpreted.—G. D.]

The Blood in Cancer of the Stomach.—KROKIEWICZ (*Archiv für die Verdauungs-Krankheiten*, Band vi., p. 25) has examined this question with results that bear out those of most other observers, and are valuable in that way. As regards the number of red corpuscles, he confirms the observations of Henry, Stengel and others, finding in seventeen cases that the corpuscles were only once as low as 1,856,000, usually between two and three millions, the hæmoglobin between 30 and 50 per cent. In two cases, with 6,360,000 and 4,800,000 corpuscles, uncontrollable vomiting explained the condition by a concentration of the blood—a fact that also explains the relatively high counts (as compared with the cachexia) in the other cases, and seems better founded than the author's view that the high count is a sign of metastasis in the peritoneum. Of the seventeen cases thirteen showed no

digestion leucocytosis, so that the author shares Löwit's opinion that this sign has about the same value as absence of HCl and presence of lactic acid. In almost all cases the alkalinity of the blood was lessened. The author ventures on an explanation of the nature of cancer cachexia, inclining to the view of Pilliet, that it is the result of intoxication with by-products of the metabolism of the cancer cells.

Respiratory Changes of the Lung Resonance.—AUFRECHT (*Deutsches Archiv für klin. Med.*, Band lxv. p. 622) calls attention to the value of this sign in certain pathological conditions. Normally the lung in expiration gives a sound that is full and low, in inspiration one that is high and less resonant, the differences being observable over all parts of the thorax. In case of a small focus of infiltration the percussion results are reversed. The sign is useful not only in determining the existence, but also the extent of an infiltration. In croupous pneumonia similar changes occur, and the sign may therefore be useful in distinguishing between it and pleurisy with effusion, especially in cases in which vocal fremitus is unavailable by reason of hoarseness or paralysis of the vocal cords. The explanation of the phenomena in cases with small infiltrations is easily made by recalling the effect of such changes on the resonance and elasticity of the lung tissue. In pneumonia increase of air in the finer bronchi and the uninvolved alveoli may explain the change.

The Atactic Form of Alcoholic Polyneuritis.—VON HÖNIG (*Deutsches Archiv für klin. Med.*, Band lxvii. p. 123), in reporting a case, gives an interesting study of the subject, with copious references tc the literature. Details must be consulted in the original. The author's conclusion regarding the pathogenesis of the disease is that its purely peripheral character can no longer be admitted, partly for anatomic, partly for clinical reasons, such as ataxia, psychic disturbances, and spasms. On the other hand, the participation of the brain, especially the cortex, is not yet demonstrated, but highly probable, while the affection of the cord is certain.

Acute Hemorrhagic Myelitis in Typhoid Fever.—SCHIFF (*Deutsches Archiv für klin. Med.*, Band lxvii. p. 175) reports a case of this kind, fatal in eighteen hours, in a man, aged nineteen years. It began on about the ninth day of the disease. The symptoms were those of an acute ascending (Landry's) paralysis, incontinence of the bladder and rectum preceding the other symptoms by several hours, and followed by complete motor paralysis of the lower extremities, with loss of reflexes, and incomplete paralysis of the arms. The mind was clear, the cerebral nerves intact. There was complete anæsthesia for all sensations in the extremities, the abdomen and thorax, sharply limited at the level of the third costal cartilage and second dorsal spinous process. There was also paradoxical respiration, the diaphragm alone acting, pulling down the lower part of the thorax and pressing forward the relaxed abdominal muscles. The lesion was evidently at the level of the boundary between the fourth and fifth cervical segments of the cord. During the few hours of the disease a bed-sore the size of the palm developed over the sacrum. Lumbar puncture five hours before death gave a non-inflammatory and sterile

fluid, under high pressure. Autopsy showed intestinal lesions of typhoid fever in the second week. The spinal cord, at the level of the fourth, fifth, and sixth cervical nerves, was swollen, dark red and soft; the normal structure obliterated. Cultures were negative. The alterations in the cord were: Multiple, irregularly distributed small recent hemorrhages throughout the whole cord and for the greater part without evidences of congestion; hemorrhagic infarction in the lower part of the fourth cervical segment, destroying almost the whole gray substance in that part; great vascular dilatation in the fifth to the eighth cervical segments, with small perivascular hemorrhages; advanced degeneration of the ganglion cells of the anterior horns in the cervical portion, even in the parts not affected by hemorrhage or hyperæmia; swelling of axis cylinders and hyperplasia of the glia in the outer part of the white matter; extensive degeneration in the posterior columns, with exudation. In addition to its special clinical and anatomical interest the case is important as an example of a toxic myelitis in the course of an acute infectious disease.

The Effect of Kreatinin on Trommer's Test in Glycosuria.—NEUMAYER (*Deutsches Archiv für klin. Med.*, Band lxvii. p. 195) has investigated the reason why glucose in urine gives an orange-red or yellow precipitate, instead of the bright red of a watery solution of grape-sugar, and why the precipitate in the case of the urine is amorphous, in the other crystalline, and also why the precipitate in the one case oxidizes rapidly on exposure to the air, while the other does not. Although it has long been known that in the one case the sediment is cuprous hydroxide, in the other cuprous oxide, no satisfactory reason has yet been advanced. Neumayer was led to an explanation by noting the effect of meat-extract on the reaction. Further investigation made it clear that kreatinin was the cause of the variation, and as in the case of glycosuria, the addition of an excess of alkali (converting kreatinin into kreatin) caused a red precipitate. The more remote cause of the difference probably depends on a reciprocal action of the kreatinin and glucose, the nature of which is not yet known.

Chronic Indurative Pancreatitis with Multiple Cysts.—POSSELT (*Prag. med. Wochenschr.*, 1900, No. 12) reports the following case as an addition to our scanty knowledge of pancreatic disease. A man, aged sixty years, previously well, began to complain of itching in the legs, and some months later became jaundiced, with dark urine and pale stools. On admission there was marked jaundice, slight emaciation. The liver was moderately enlarged, hard, the edge not palpable. In the right side, below the ribs, a round resistant area was palpable. The appetite was good. Œdema gradually developed in the legs, and ascites appeared later. Puncture of the mass in the right side, supposed to be the gall-bladder, gave a clear, greenish fluid. Three months after admission the patient died suddenly, having had for some time loss of appetite, diarrhœa, and frequent polyuria. Autopsy showed the pancreas, especially the head, full of cysts, with smooth walls and milky contents, sometimes containing gelatinous particles. The pancreatic and common bile ducts were occluded. The liver and gall-bladder showed merely the results of obstruction. The clinical diagnosis of multiple

echinococcus cyst of the liver was certainly excusable under the circumstances, though the enlargement of the liver was not as great as usual in that disease, and the total nitrogen and urea were less than in the cases observed by the author. The absence of glycosuria (alimentary) was also an interesting feature in the case.

Lowit's Hæmamœba of Leukæmia.—Although Löwit's assertion of the finding of protozoa in leukæmic blood has been received with commendable skepticism, the claims made in his recent book (*Die Leukamie als Protozoenkrankheit*, 1900) are so explicit that they demand control. It is therefore interesting to learn of a criticism by W. Türk. Before Löwit's methods were known Türk believed the bodies described were either mast-cell granulations or artefacts of the latter. This was denied by Löwit, however, who claimed the mast-cell granules were not acid-resisting. Türk now says (*Wiener klin. Wochenschrift*, 1900, No. 13) that he has made controls by Löwit's method, and not only adheres to his earlier view, but has also made some interesting observations in the bodies in question. Using preparations fixed by heat, he finds that while concentrated alcoholic methylene-blue stains the granules a distinct violet, a concentrated watery solution causes a curious deformity of most of the granules, so that in the protoplasm of the mast-cells large or small, round, oval, angular, tape-like or even branching violet masses can be seen, along with occasional granules. There is evidently a partial solution of the granules caused by the watery stain, which is in proportion to the degree of dilution. Löffler's solution acts in the same way, but not to the same degree. The mast-cells of normal blood are more resistant to the action of the watery solution than those of leukæmia, but even then the so-called amœbæ can be demonstrated, and in rabbits' blood also the artefacts can be produced, though with difficulty. The criticism of Löwit's conclusions and animal experiments given by Türk is to the point, but hardly necessary to abstract.

Skin Manifestations of Influenza Observed in the Present Epidemic.—Herman (*New York Medical Journal*, February 17, 1900, p. 238), in a brief note on the influenza epidemic at present prevailing in Brooklyn, states that the disease is mild in character, but extremely infectious. Once it invades a house at least two or more members are attacked.

The respiratory, gastro-intestinal, and cerebro-spinal forms have all been seen. Herman draws special attention to the skin manifestations. He states that these eruptions are something new in the United States, but that they have been described in England and Continental Europe since the epidemic of 1890. The eruptions that he has most frequently seen have been those simulating scarlet fever, measles, and herpes.

The scarlatiniform rash has been frequently described in England. The eruption simulating measles resembles the papular form, and may be confined to the cheeks, or it may cover the entire surface of the body. The herpetic eruption has been frequently called urticaria, but Herman thinks that it is more properly called herpes. One of his cases had a typical herpes zoster, and infected two other children in the same family with a dissemi-

nated herpes. He has succeeded in demonstrating the presence of the Pfeiffer micro-organisms in his cases, but does not specify whether from the respiratory tract or from the herpetic lesions.

SURGERY.

UNDER THE CHARGE OF

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Anthrax of the Thigh Treated by Operation; Recovery.—SINCLAIR (*British Medical Journal*, March 31, 1900) reports a case of anthrax which is interesting, because the bacteriological source of the infection was very evident. The patient, a healthy laborer, while wheeling a barrow laden with bone manure, was accidentally pricked on the inner side of the thigh, in the lower third, by a splinter of wood on the barrow handle. Feeling something scratch him in this situation, he extracted a tiny slip of wood from his trousers and continued his work, taking no further notice of the occurrence, as the spot was not painful. In three days a pimple formed and became a sore, which grew daily larger and more painful. When first seen the characteristic signs were manifest—the central depressed black slough surrounded by a complete ring of vesicles. Inflammatory redness and swelling extended around for an area of seven inches by five, and very marked enlargement and tenderness of the femoral glands had recently supervened.

The area involved was freely excised and the glands removed. The bacteriological examination of the fluid from the blebs showed the bacillus anthracis. The fluid from the central part of the slough showed a few bacilli and many streptococci. The swollen lymph-glands contained no anthrax bacilli that could be detected. Inoculation into a mouse resulted in death in thirty-six hours, and showed anthrax in the spleen.

The Treatment of Irreducible Luxations of the Elbow.—LOISON (*Revue de Orthop.*, March, 1900) reviews two cases in which the luxation had existed for two and four months unreduced. There were contractions of the muscles, the torn lateral ligaments had been repaired in the new position, and there were possible adhesions between the anterior portion of the capsule and the humerus. The principal obstacle to reduction was, however, found in the callus which had formed in front of the joint, involving the deep fibres of the anterior brachial and triceps muscles.

The author derives the following lessons from the treatment of these cases. Shall the attempt be made in such cases to secure the restoration of the joint by massage and passive motion? In such cases as these it will not succeed, nor will forcible motion under an anæsthetic. The same is true of the subcutaneous resection of the fibrous adhesions. In such cases as these they would produce no good results, as there was newly formed bone which prevented the motion. The removal of the principal mass of callus was unavailing in the first case, and the author does not believe it worth the attempt.

An arthrotomy is valuable in a recent luxation that is irreducible; but in one of older date the author believes that the only resort that will give a chance of success is to perform a partial or complete resection.

A Loose Foreign Body in a Hydrocele Sac.—BENSON (*Lancet*, March 17, 1900) reports the case of a boy, aged fourteen years, in whom a hydrocele had persisted for some time in spite of three tappings. Upon examination a hydrocele of about the size of a golf-ball could be detected. It affected the cord only, and was quite free of the coverings of the testicle. No communcation could be detected in the peritoneal cavity. The operation showed the sac connected with the cord, from which it was freed. The furuncular process was not completely obliterated, so it was ligated and treated as a hernial sac. The hydrocele sac was removed intact. A small opaque body was noticed within it, and freely movable. The sac was opened and an ounce of clear fluid escaped. The foreign body proved to be a small mass of hard, fatty tissue. The outer part was somewhat loose in texture, very uneven, and somewhat nodular.

Observations on the Treatment of Cancer.—ROBINSON (*Medical Record*, March 31, 1900) summarizes his views in the following conclusions:

1. That at present we know of no drug, animal extract, serum, or toxin which, given internally by any avenue of the body, can be relied upon for the cure of cancer of any part of the system.

2. That the statement that the knife is the only reliable agent in the treatment of cancer is not correct.

3. That certain caustics, judiciously chosen and properly applied, may attack deposits of the growth inaccessible to the knife, and in these cases should be employed, even if the knife is necessary to prepare the way for their use.

4. That in some cases both the knife and caustics should be used, and in some other cases curettage, followed by a caustic, is the proper procedure.

5. That the majority of cases of cutaneous cancer can be removed with greatest certainty and with least deformity by caustics, provided the patients are seen before the lymphatic glands are invaded.

6. That the knife should be used when the lymphatic glands are invaded, and also in some other cases of external cancer.

The Cardinal Pathognomonic Sign of Fracture of the Lower End of the Radius (Colles).—WARE (*Medical Record*, March 31, 1900) calls attention to an old sign of Colles' fracture, which he considers the cardinal pathogno-

monic one. It is the sign of Langier, which he has found reliable in diagnosing 300 cases of fracture of the lower end of the radius that have come under his observation.

This sign is based on the relation of the ulnar and radial styloid. The styloid of the radius is at a lower level than the styloid of the ulna. This is always the case, normally differing in degree according to the development of the bones, being more marked in males than in females, less so in infancy. With the hand in the prone position and on the same plane with the bones of the forearm, this sign is most readily ascertained by then impinging the thumb and index finger against the styloids, and projecting a line between the two points, it will take an oblique course, slanting to the radial side.

An estimate of the existence of the levelling or elevation of the radial styloid should be the first manœuvre in ascertaining a fracture, thus precluding any further manipulation until reduction is performed. It would suggest itself that this relation of the styloids ought to be an index to proper reduction; this is but relatively so, as an absolute restoration of the normal relation of the styloid is impossible in the greater number of instances. The presence of an altered relation in an old case indicates an old fracture.

Neoplasms of the Kidneys.—McArthur (*The Chicago Medical Record*, March, 1900), in speaking of the treatment of these neoplasms, says that he prepared a paper to read before the society just prior to the announcement by McBurney of his method of separating the muscular fasciculi in entering the abdominal cavity. This method is equally applicable for approach to the kidney as well as to other abdominal organs. One will be surprised both by the room permitted and the perfect falling together of the parts after the operation, as well as by the speedy union.

Second, bitter experience has taught him that in nephrectomy, whenever possible, the renal pedicle should be temporarily clamped and cut. Only after removal of the tumor is it satisfactorily possible to treat properly the separate elements of the pedicle. Slipping of ligatures otherwise applied is prone to occur.

Third, on the right side avoid traction or occlusion of the vena cava. Even temporarily shutting off the returning blood-supply to the heart makes a dangerous, even fatal, shock. He had a death that occurred thus.

Fourth, never do a nephrectomy until sure of both the existence and functional capacity of the kidney on the opposite side. The urine on that side should not only be normal, but in sufficient amount. He nephrotomized a patient with an infantile kidney. The conclusion—normal urine, normal kidney—is not logical.

Fifth, study carefully the clinical history. He operated upon what proved to be a syphiloma of the kidney, but did not remove it. Recovery followed a study of the history and appropriate treatment.

Sixth, every renal operation that can be done without entering the peritoneal cavity is the safer operation, and should be selected.

Expanded Metal a New Splint Material.—Hübscher (*Centralblatt für Chirurgie*, March 3, 1900) calls attention to this new building material as valuable and convenient for making splints. It can be made of any metal,

as aluminum, and with metal shears is easily cut into any desired form. The open, lattice-like form of the metal makes it yield readily and conform to the contour of the limb, and yet when bound in place it is very rigid. In dressing a leg the foot-piece is made by cutting the metal transversely nearly half its breadth on each side; it is then turned up along the sole of the foot, the cut ends interlocking into the leg portion of the lattice work. Angular splints of great rigidity are made in this way for any portion of the limbs or body.

When combined with plaster-of-Paris this splint produces exceptional rigidity, and yet can be made much lighter than a splint made in the ordinary way of plaster.

A Case of Rupture of the Rectum, with Recovery —ENGLAND (*Montreal Medical Journal*, February, 1900) reports the case of a little girl, aged twelve years, who fell from a piano-box upon a broom handle. The end of the handle entered the anus and penetrated the body to the extent of from twelve to fifteen inches. She succeeded with some difficulty in withdrawing the broom handle and went to the house. The family physician saw her and brought her seventy miles to the author, who saw her twenty-six hours after the accident. Her condition was unpromising. The face blanched and pinched; extremities cold; pulse small, weak, and rapid; temperature 101° F. There was also general abdominal tenderness, with fixation of the abdominal muscles, but there was no distention. There had been pain, though not of a severe character, and some vomiting; much loss of blood was also said to have occurred during the journey.

After the patient was anæsthetized, the anus on inspection was found bruised and patulous and the surrounding skin ecchymosed. On digital examination (per anum) a large rent was discovered in the rectum, situated about three inches from the anal orifice, and through this opening the finger readily passed into the peritoneal cavity. The rectum was washed out; an artery was caught and ligated and the rectum packed with iodoform gauze. The patient was placed in the Trendelenburg position and the abdomen opened. The rectal tear was easily located after the grumous material found in the peritoneal cavity had been carefully sponged out. The tear was closed with a continuous and a mattress Lembert suture. Injection of normal salt solution and stimulation with hypodermics of strychnine and brandy were found necessary on account of the patient's exceedingly grave condition. After the operation the patient was kept for two hours in the Trendelenburg position, surrounded with hot-water bottles and blankets. The pulse, though very small and rapid, was still perceptible. For three days stimulants, heart tonics, and nutrient enemata were persistently employed. The pulse remained rapid and small for some time. At 4 P.M. on the second day the temperature rose to 101.6° F., but fell to 98.5° F. on the following day. Convalescence was very slow, but the patient finally recovered completely.

A Removable Deep Suture.—SCHOEMAKER (*Centralblatt für Chirurgie*, April 7, 1900, No. 14) describes a simple removable suture which overcomes the difficulties that have surrounded the employment of non-absorbable mate-

rials in uniting abdominal wounds layer by layer. It is nothing more nor less than the chain-stitch sewing of the older machines. A needle is employed having the eye in the point. It is carried through both sides of the wound and the loop caught. Without unthreading the needle it is withdrawn and the second stitch taken. This time and on each successive stitch the loop is carried through the last loop, thus locking it. The final stitch is carried out through the skin and the end pulled through the loop. When it is to be removed the end is withdrawn from the last loop by pulling on the thread, each successive loop is drawn out, and the whole thread is thus released. The thread can be drawn very tight without interfering with its removal, but rather facilitating it.

Vomiting Considered from Some of Its Surgical Aspects.—BENNETT (*British Medical Journal*, March 24, 1900) calls attention to the fact that many of the deaths that are attributed to anæsthetics are in reality the result of infection of the lungs by the inspiration of vomited matter while the patient is unconscious. Under these circumstances he points out the desirability, in all cases in which the administration of an anæsthetic is necessary, when there is any possibility (to say nothing of probability) of the stomach being a reservoir for offensive material or half-digested food, that the proper practice to adopt is stomach lavage, with the object of preventing the possibility of lung implication from the passage of portions of the contents of the viscus down the trachea.

There is also a form of late vomiting which comes on a few hours or a few days after the operation and threatens the life of the patient. It would not have occurred if the anæsthetic had not been administered, and is, therefore, a result of its employment. In cases in which there is reason to believe that the administration of an anæsthetic is likely to be or has been followed by very grave vomiting it is advisable to wash out the stomach thoroughly before the commencement of the operation, by which the tendency to subsequent vomiting may be altogether obviated; and, further, that vomiting of the ordinary kind which follows the administration of an anæsthetic may be frequently avoided by the same means.

The author reviews a series of cases that have led him to the conclusions that:

1. Feculent or stercoraceous vomiting occurs more commonly than is supposed in cases in which no mortal disease exists. The occurrence of feculent vomiting must of necessity be a grave symptom, but it is not always followed by death, even though nothing be done for the patient from a surgical point of view.

2. That in certain cases the vomiting is curative, inasmuch as it empties the bowel and stomach of accumulated contents, which for the time being are unable to find their way downward in the normal way. This view is supported by the fact that in the cases narrated a very copious and, as it were, final vomit immediately preceded the change of the patient from an apparently hopeless state to the commencement of recovery.

In reference to the question of determining whether recovery will take place without radical surgical measures, this depends for its value on one sign: this is the condition of the belly with regard to distention. If with

the continuance of vomiting there is persistent increase of abdominal distention, the condition is a mortal one unless radically relieved. If, on the other hand, with the continuance of vomiting there is no increase of distention, there is reason to hope that active interference is unnecessary and that recovery may follow "the casting off of the complaint" effected by the cleansing out of the stomach and intestines in the upward way.

The bearing of this point, if it is worth anything at all, upon treatment is obvious, especially in cases which, having been submitted to abdominal section, vomiting of the kind under discussion follows immediately after or comparatively remotely. The application of the point is this: If with vomiting there coincides increased distention, nothing can save the patient but reopening the abdomen with a view to the removal of the cause, if that is possible. On the other hand, should there be no increasing distention, operative measures may reasonably be deferred, since the chances of spontaneous recovery are good enough to negative the propriety of running the risk so serious as a second operation under the circumstances must entail. When no operation has been performed the practical bearing is the same, and the urgent necessity for operation or the reverse depends on whether there is or whether there is not increasing abdominal distention coinciding with the vomiting.

In conclusion, the matter may perhaps be comprehensively summed up in the statement that in cases of abdominal disease or injury, feculent vomiting, as such, is no positive indication for surgical interference unless it is accompanied by increasing abdominal distention.

A Case of Purulent Pericarditis: A Method of Opening the Pericardial Sac.—OGLE and ALLINGHAM (*Lancet*, March 10, 1900) report a case of purulent pericarditis in which the pericardium was opened, a large quantity of pus removed, and then cleansed without interfering with the action of the heart and with a decided benefit to the patient, with a relief of severe symptoms. The condition had, however, been left too long unrelieved. This was due to the difficulties in the way of diagnosis and to the lack of knowledge of the impunity with which the heart can be handled, not only without harm, but with positive and very evident benefit, as was shown by the remarkable improvement of the pulse in regularity, strength, and tension during the process of cleansing the heart.

The value of such intervention has suggested to the authors a method of operating, which they describe as follows: "1. An incision of about three inches in length, with the upper end at the costoxiphoid angle, is made along the lower edge of the seventh left costal cartilage; the latter is then exposed by separating the abdominal muscles from it; the cartilage can then be pulled somewhat outward and upward, when the fibres of the diaphragm become visible, together with the cellular interval between its attachments to the cartilage and to the xiphoid appendix. 2. This cellular interval is enlarged by cutting or tearing through the muscle of the diaphragm as far as may be necessary, when a mass of fat is usually seen just above the diaphragm, in the space between the pericardium behind, the sternum in front, and the diaphragm below. 3. This fat, together with the diaphragm, is pulled downward, when the pericardium presents itself and can be incised

or opened up with forceps at its lowest part in front, and a large hole being made, a finger inserted can explore the heart over its whole extent back and front, nearly as far as its extreme base. During the operation the peritoneum may be exposed as it sweeps downward from the under surface of the diaphragm. It is, of course, not injured, but is pushed aside as is done in performing a suprapubic cystotomy. The superior epigastric artery is not wounded, but can be kept well inside, toward the middle line, on separating the tissues after cutting through the attachment of the abdominal muscles to the seventh cartilage."

They claim the following advantages for this method: "1. The pleural cavity cannot be injured, as it is far away in the normal arrangement of the organs, and would be still further removed in pericardial distention. It would seem, indeed, that the method described is the only sure way of entering the pericardium without wounding the pleura, for the latter frequently covers the fifth and sixth intercostal spaces, even up to the sternum. 2. Drainage is from the most dependent portion of the sac, when the patient is half propped up, and is through a large opening not bounded by cartilage or sternum. 3. Great ease is afforded for the exploration and cleansing of the heart, both back and front, to its extreme limits."

PEDIATRICS.

UNDER THE CHARGE OF

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AND

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Tetanus Successfully Treated with Antitetanic Serum.—HIBBERT (*New England Medical Monthly*, November, 1899, p. 427) reports a successful case. The patient was a boy, aged twelve years, whose feet were scratched by a wire fence. Five days later he complained of stiffness in the muscles of the neck and jaw, and on the following day was unable to open his mouth wide enough to permit the insertion of the little finger. There were sharp, shooting pains which extended from his legs upward to the back of the neck. He was very nervous and sleepless, and had a temperature of 100.5°, the pulse being 110. He was first seen on the sixth day after injury, and ten-grain doses of chloral were given. On the seventh day the symptoms were more aggravated. Ten c.c. of serum were given, and a second dose twelve hours later. A third dose of the same quantity was given after twenty-four hours.

Great improvement was observed the following day, and steadily continued, so that in six days all rigidity of the muscles had disappeared, and substantial nourishment was taken. The only alarming symptom during the period

of convalescence was a very irregular and frequent pulse, which was readily controlled by appropriate treatment, and in a few days more recovery was complete.

A Note upon Kernig's Sign in Infants.—FREDERICK A. PACKARD (*Archives of Pediatrics*, April, 1900, p. 259) reports three cases of verified meningitis in infants, two of whom were aged sixteen months and one four months, in which Kernig's sign was not present during life. He believes the sign to be of value in the diagnosis of meningitis in the adult and in older children, but is disposed to attach little importance to its absence in cases of distinct meningitic symptoms in infants. His observations so far have not permitted him to determine at what age the sign becomes more significant.

[We can confirm Dr. Packard's observation of the frequent absence of this sign in cerebral meningitis occurring in infants under two years of age. —ED.]

The Role of the Calcium Salts in the Pathogenesis of Rhachitis.—Recent researches having shown that rhachitis cannot be attributed either to an insufficiency of the salts of lime in the food, or to an inadequate absorption of these salts because of too rapid elimination by the rhachitic, STOELTZNER (*Jahrbuch f. Kinderheilkunde*, Band l., S. 268) has undertaken to repeat the experiments of Brubacher, and has made a study of the body of a non-rhachitic infant and of four rhachitic infants to ascertain the proportion of the lime salts in the fresh tissues of the brain, lungs, heart, liver, and spleen. These researches have confirmed the conclusions of Brubacher in showing that in the tissues and organic fluids of rhachitic infants the lime salts are found as abundantly as in the non-rhachitic.

It follows, therefore, that the cause of the non-calcification of the osseous tissue of rhachitics should be sought in a particular condition of the bony tissue itself, and not in some peculiarity of the blood plasma with regard to the lime salts.

This conclusion is supported, besides, by the early experiments of the author, who showed that, when young animals are fed upon a diet entirely deprived of the salts of the alkaline earths, osseous lesions are produced which in no respect resemble those of rhachitis. In the former there is an insufficient formation of osseous tissue, while in rhachitis the formation of this tissue is normal, but calcification is deficient.

Lesions of the Kidneys in Congenital Syphilis.—HECKER (*Jahrbuch f. Kinderheilkunde*, 1900, Band i. (n. s.), S. 375) states that the renal manifestations of congenital syphilis have been little studied, and that this is the more surprising since in these organs the diathetic lesions can be better observed than in the liver. He has carefully studied the kidneys of ten dead-born syphilitic infants, and of nine syphilitic nurslings which lived for a short time, none beyond the age of three months. For control the same study was made of twelve dead-born infants, premature or at term, but free of syphilitic taint.

With the nineteen syphilitics the kidneys were affected in every case.

UofM

When the infant was prematurely born there was found a small-celled infiltration of the small vessels of the cortex and sometimes of the larger vessels of the medullary substance; almost always there existed at the same time a proliferation of the interstitial connective tissue, and, very often, an endoperiarteritis of the small vessels of the cortex. With the infants born at term the vascular and perivascular infiltration is less marked, but there are more or less distinct evidences of degeneration of epithelium. It is only in the infants that have lived for a time, and especially the nurslings, that parenchymatous lesions appear very distinctly. The epithelium is atrophied and shows fatty degeneration, with signs of desquamation of the cells and secondary dilatation of the urinary tubules, which contain hyaline and granular casts. The Malpighian bodies show evidence of inflammation and destruction, diapedesis of leucocytes into the capsular space, desquamation of the epithelium and proliferation of the capsular endothelium, with atrophy and fatty degeneration of the capillary tufts. The distinction between the renal changes in the syphilitic fœtus and those in the nursling, as just described, is not always clearly marked, and intermediate types are frequent in both groups. The difference of the processes in the two groups is still further marked by another sign. The proliferating nephritis of the fœtus produces an increase of weight of the kidneys (one eighty-sixth of the total weight of the body as compared with one one-hundred and twenty-third in the normal fœtus), while in the atrophic nephritis of the syphilitic nursling the kidneys are diminished in weight, being one one-hundredth of the body weight as compared with one ninety-fourth in the normal infant.

Clinically, syphilitic nephritis of the nursling produces appreciable symptoms. Of the twelve cases studied, albumin was present in ten, often in notable quantity, with casts in great numbers.

Diphtheria of the Vulva.—E. E. WARE (*Lancet*, 1900, i. p. 392) reports an unusual case observed in a well-nourished girl, aged four years. For five days prior to admission to the hospital she had suffered great pain on passing urine, the act sometimes taking a quarter of an hour because of frequent involuntary stoppages. She had lost appetite and had been listless. Temperature was 100° F., the pulse 120, and respiration 28. The vulva was seen to be unduly red and was very sensitive. The urine was acid, specific gravity 1015, and contained no albumin, pus, nor blood. Pain during micturition was very severe, but did not continue after the act.

Three days later careful exploration of the bladder with the sound and through the rectum yielded only negative results, but it was noticed that two white patches, about one-eighth of an inch in diameter, were present upon the vulva, one on the vestibule, the other on the right nympha; and these had the appearance of diphtheritic membrane, a conclusion that was promptly confirmed by culture. The throat and eyes were negative. Two thousand units of antitoxin were given, and two days later the membrane had disappeared, the redness of the vulva was less marked, and micturition was accomplished with very little pain. The temperature was 98° F., and the pulse 120.

One week later micturition was quite painless and the vulva was perfectly normal in appearance, but the child was still very listless. Nineteen days

after the disappearance of the membrane the temperature rose to 102.8° F., the pulse to 150, and the child vomited. Nasal regurgitation of fluid was now noticed, and persisted, though less markedly, for a week, after which convalescence was uninterrupted.

[The case is interesting not only for the unusual site of the membranous exudate, similar examples of which are occasionally reported, but also for the occurrence of paralytic symptoms in the fauces. According to the usually described progress of diphtheritic paralysis, those parts are first affected which are nearest to the usual seat of the disease (throat or nose), and thence the rest of the muscular system is affected in somewhat regular order. In Dr. Ware's case the fauces seem to have been the only location of paralytic symptoms, the portions of the body nearer to the focus of disease apparently having escaped altogether.—ED.]

Spontaneous Gangrene Consecutive to Pneumonia in a Child.—ZUPPINGER (*Wiener klinische Wochenschrift*, 1899, No. 13, S. 335) reports a case observed in a girl, aged five years, in which the symptoms began, the day after the crisis of a frank pneumonia, with severe pain in the right great toe. Two days later the whole foot became livid, while similar areas appeared on the left foot, the right knee and elbow, and the left shoulder. After a time the lividity faded from the areas on the elbow and the knee, but over the other parts vesicles appeared, followed by gangrene.

Two months later the following lesions were noted: On the back an ulcer of butterfly shape, 10 cm. by 9 cm., covered with healthy granulations. The anterior part of the left foot was completely disorganized, while on the right foot the great toe was gangrenous, with denudation of the head of the first metatarsal bone; the terminal phalanx of the second toe and the second and third phalanges of the third toe were also destroyed. Pulsation was felt in the popliteal artery only upon the left side.

The left foot was removed by a Pirogoff amputation, and upon the right foot the necrosed first metatarsal and the first cuneiform bones were removed. The child made a good recovery.

The author states that this is the first recorded case of post-pneumonic gangrene in a child. In the adult this complication of pneumonia has been reported by Benedikt (gangrene of the foot), by Grimm (gangrene of the fingers), and by Nielsen (gangrene of the fingers and toes).

Chronic Articular Rheumatism in Children.—Three instances of this rare condition in childhood are reported by LACHMANSKI (*Archiv f. Kinderheilkunde*, 1900, Band xxviii., S. 104) in a paper treating of both the acute and the chronic forms of the disease.

The first case was seen in a girl, aged ten years, without hereditary antecedents, the affection beginning as a subacute polyarthritis. For several months there were alternating conditions of improvement and relapse in one or more of the articulations. At the same time there were febrile movements of long duration which accompanied or seemed independent of the articular manifestations. Pain was occasioned by efforts at walking, but was relieved by rest. Despite careful treatment and diet, muscular atrophy, without reaction of degeneration, progressed, and the articular deformity became more

pronounced. All the articulations were involved, even those of the vertebræ and the temporomaxillary joint. Nearly all the joints affected became anchylosed, rendering the patient helpless. No visceral lesions could be detected.

In the second case, a boy, aged eight years, there was chronic articular rheumatism of all the members except the left arm. After a period of slight improvement the symptoms became suddenly aggravated. The child remained under observation for only three weeks. The third observation, of which only a few notes are given, was really a case of arthritis deformans in a girl aged eight years. The disease had begun as a chronic polyarthritis.

THERAPEUTICS.

UNDER THE CHARGE OF

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On the Administration of Anæsthetics to Children.—Mr. W. I McCURDIE and DR. C. F. MARSHALL insist that the administration of anæsthetics, especially chloroform, to children is by no means so free from danger as is generally supposed. The muscular system in children is comparatively feeble, so that rigidity is less marked. Elasticity of the chest is at its maximum, so that artificial respiration can be easily and effectively performed. The bloodvessels are more elastic and their contraction tends to counteract any full pressure. The mucous membranes are more sensitive to irritations, particularly of the respiratory tract and the stomach. Cough and mucous secretion are often easily excited, and vomiting tends to occur more rapidly and with less warning than in the case of adults. The nervous system is more sensitive and reacts more quickly to stimulation; hence there is greater tendency to shock, and recovery from it is more rapid. Reflex action is more marked and also more quickly abolished. This results, in the first place, in increased danger from such reflex effects as spasm of the glottis. In the second place, the early abolition of reflex action results in the disappearance of certain guides which are habitually used in the adult, more especially the corneal and conjunctival reflexes, which in children are usually lost some time before anæsthesia is complete. Nervousness and fear are often strongly manifested. The pulse is not quite so reliable a guide in young children as in adults. In preparation for anæsthesia nothing but digestible foods should be given. Milk is forbidden, because curds may be formed under the influence of fear, which may remain undigested for several hours. Whey, or a good meat broth, is recommended. Since children are so liable to shock, they should be kept warm by various devices during the operation. Anæsthesia must be induced with as little crying and struggling as is possible. The dosage of the anæsthetic should be at first continuous and of gradually

increasing strength, while the maintenance of narcosis should be by intermittent doses. As a routine anæsthetic, either the alcohol-chloroform-ether mixture, or a mixture of two parts of ether to one of chloroform, is recommended. For shorter operations nitrous oxide alone, or with oxygen, possesses advantages. Nitrous oxide, however, should not be followed by chloroform. Of the difficulties met with during operation, reflex spasm of the glottis is frequent. When this occurs it is best to push the administration of ether; pushing chloroform is dangerous, owing to the liabi ity to inhale an overdose when the spasm has passed off. If the breathing becomes shallow it may be improved by gently rubbing the lips. If it still fails after removal of any obstruction, artificial respiration must be performed and strychnine and atropine injected subcutaneously. Injections of strychnine and atropine or digitalis are to be used to relieve heart-failure. If this occurs during the commencement of administration and after struggling, it is due to engorgement of the right heart, and should be treated by raising the patient to the vertical position, in order to relieve the overdistended right heart by gravity. If it occurs at a later period it is due to vasomotor paralysis or to the toxic effect of the anæsthetic or the medullary nerve-centres. The treatment for this condition is either partial or complete inversion of the patient, together with artificial respiration. Vomiting after administration may be relieved by sipping hot water or by inhaling vinegar from a handkerchief.—*Treatment*, 1900, No. 2, p. 65.

[If digitalis is to be of any use in heart-failure during surgical operations it should be administered at least thirty-six hours before the operation takes place. For it the quickly acting sparteine or strophanthus should be substituted.—R. W. W.]

Adonidin.—Dr. Heinrich Stern states that this remedy, notwithstanding its most prompt and energetic action, may be safely administered in pathological conditions where digitalis, if given at all, should be administered only with the utmost caution. This refers to fatty degeneration of the heart, pericarditis, simple hypertrophy, compensatory hypertrophy, and certain atheromatous conditions. In rapidity of action adonidin almost equals nitroglycerin. In this respect it surpasses by far other heart remedies, as digitalis, digitalin, digitoxin, caffeine, sparteine, strophanthus, convallaria, and convollamarin. In certainty of action it equals nitroglycerin and surpasses by far caffeine, sparteine, convollamarin, strophanthus, and digitalis or its glucosides. In permanency of action, although no cumulative effects were ever noted, it surpasses nitroglycerin, caffeine, convollamarin, sparteine, digitalis, digitalin, and digitoxin. Its diuretic action in health is limited. As a physiological diuretic it is decidedly inferior to caffeine, strophanthus, convollamarin, and sparteine. In certain affections of the kidney and in pyretic conditions its diuretic action is more pronounced, which is probably due to increased arterial tension. Its greatest diuretic effect is exhibited in conditions accompanied by dropsy and low arterial tension. In the healthy individual it causes a slight increase of temperature, but it tends to lower the body-heat in pyretic conditions. The dose varies from one-thirtieth to one-tenth of a grain two or three times a day. One-sixth of a grain administered in any form influences the œdematous condition and produces diu-

resis, especially when the arterial tension is low.—*Merck's Archives*, 1900, No. 5, p. 163.

[If the irritant properties of this remedy can be eliminated it would meet certain indications more satisfactorily than others of this class.—R. W. W.]

Treatment of Pertussis.—Dr. H. R. NORTON states that rectal injections of carbon dioxide gas given thrice daily, and for from five to ten minutes, had apparently benefited 143 of 150 patients. In instances of severe disease the vomiting had diminished or ceased by the second or third day. The duration of the disease had not been influenced. During the administration of the gas the entire cutaneous surface would flush, especially the face. In a few instances a mild diarrhœa had been set up, apparently as the result of irritation of the rectum by the injection tube. In the following year twenty patients had been treated with a negative result in all; at this time the gas had been taken from the tanks in which it had been compressed.

Various Therapeutic Serums.—DR. ANTONIO FANONI sums up the present state of our knowledge concerning their value. The efficiency of Pane's serum in lobar pneumonia has been recognized by impartial observers. When injected early enough in sufficient quantity, and if not deteriorated by age, it quickly produces a lowering of the temperature, an improvement in the subjective comfort of the patient, as well as an amelioration of all the other symptoms. Resolution also tends to take place more quickly. Marmorek's antistreptococcus serum has the disadvantage of saving the animals experimented upon only from the streptococcus which was used to prepare the serum, and not from the other varieties of streptococci. It has, however, a certain effect on animals infected with other streptococci, enough to retard death when compared with the control animals. The Yersin-Roux serum against the bubonic plague is very active, judging from experiments on animals; but in man the results are not very satisfactory. The same may be said of the serum of Lustig. About the serum against yellow fever, nothing definite can be said. Maragliano's serum against tuberculosis when put to the test in treating tuberculous patients has given indisputable recoveries. Some of the patients after this treatment finally become immune against doses of tuberculin that are ten times larger than the initial dose which was sufficient to produce a reaction. Tizzoni's antitetanic serum gives results which are very satisfactory. Inasmuch as in diphtheria and tetanus the death of the patient is brought about by the action of the toxins produced by the respective bacteria, the action of these serums indisputably takes place against their respective toxins by counteracting the intoxication of the organism. On the other hand, in puerperal fever due to streptococci, in lobar pneumonia caused by the pneumococcus of Fraenkel, and in bubonic plague produced by the bacillus of Yersin, the toxic phenomena are of secondary importance, while the predominant manifestations are the infectious phenomena—that is, those produced by the bacteria in their immediate contact with the cells of the organism. It is evident that the products of the metabolism of these bacteria, even without the formation of toxins, would be enough to produce such changes in the single cells as to destroy life. The failure of Pane's serum when employed in the pre-agonal stage is explicable

on the ground that we cannot restore the functions of the cells, which are indispensable to the life of the entire organism, once they are destroyed.—*Pediatrics*, 1900, No. 10, p. 393.

Therapy of Kola.—Dr. C. C. Tarbrough believes that this drug is a general tonic stimulant, acting primarily on the cerebro-spinal centres. No depressing effects follow as the influence of the drug wears off. Thus there is absolutely no danger of forming a kola habit, no such result being on record. Its physiological action is analogous to caffeine; but in the fresh state it differs in that it is more pronounced and prolonged. Fresh, undried kola apparently is more active because the caffeine is presented to the system dissolved in the natural juices of the drug, and is readily liberated in a highly active condition. Failure to obtain good results from the drug are very often ascribable to preparations representing the dried drug. Pertussis is much benefited by kola; the attack is cut short and the general condition rapidly improved. Very many patients with asthma experience immediate and sometimes permanent relief. This applies especially to asthma of nervous origin. That due to pressure (tumor) is unaffected by the drug. Kola is a decided diuretic, acting more fully on some people than on others. It is more prompt and efficacious than digitalis and caffeine in combination. It affects the kidney directly, but, in addition, by raising the blood-pressure. As a cardiac tonic it ranks with digitalis; it has, however, no cumulative action, and it is therefore a good substitute for digitalis, or they can be used in combination. Melancholia has been very satisfactorily treated with kola, in some instances complete cure being obtained. In chronic alcoholism and morphinism, kola is invaluable as a stimulant and to support the system against the shock of gradual or sudden withdrawal of the accustomed stimulant. Surgical shock can be combated and even prevented by kola given immediately before and after operation. Collapse is much less likely to ensue. Uterine inertia due to nervous exhaustion responds to the stimulus of kola. Normal perspiration is aided also. The characteristic action of the drug is its sustaining, strength-conserving power, and it is particularly of value when fatigue and exhaustion are imminent, as in loss of sleep.—*Virginia Medical Semi-Monthly*, 1899, vol. iv. p. 429.

[The caffeine-percentage increases in kola on drying, therefore, the preference for the fresh drug is hardly warranted.—R. W. W.].

The Therapeutic Value of Intravenous Injections of Iron.—Dott F. Aporti has found, after exhaustive research, that the excellent results obtained are due to the remedy and not to other treatment. Within a few days it is possible to increase the hæmoglobin fifty per cent. This is an excellent method, devoid of danger and certain in its results.—*Gazetta degli Ospedali e delle Cliniche*, 1899, No. 131, p. 1386.

Artificial Inoculations.—Dr. Dyce Duckworth reports that after two injections of the serum (ten days intervening) there was noticed severe constitutional and temporary local disturbance, general malaise, headache, diaphoresis, with locally a "bruised feeling," an appearance resembling cellulitis, and a very slight febrile movement. One week after the second

inoculation Widal's test was made, and a very sharp reaction followed, even with a dilution of one to two hundred. A like procedure in a second patient gave the same results. The second inoculation, after an interval of some days, is strongly advised to secure the full benefit of the vaccine. Perfect asepsis is, of course, requisite The patient is to remain in bed two days, keeping quiet until all reaction has ceased. Following these precautions in healthy subjects, results are satisfactory. Widal's test should be tried every six months for some time.—*The British Medical Journal*, 1899, No. 2029, p. 1407.

Diphtheria.—Dr H B. Sheffield notes the local nature of the disease primarily, and that constitutional effects follow through the rapid absorption of the toxins locally formed A fatal result is due either to septic poisoning or to obstruction of the air-passages. From this the following deductions are made: 1. Endeavor to reduce hyperæmia and excessive exudation in the throat in order to avoid respiratory obstruction. 2. Destroy so soon as possible the diphtheria bacilli, locally, to prevent formation and absorption of toxins. 3. Administer such remedies as will combat or neutralize the toxins, preventing their general dissemination. 4. Promote the action of emunctories in general. Among the germicides this prescription is highly recommended: ℞.—Glycerite of papoid, 30; carbolic acid, 1; powdered camphor dissolved in alcohol, 1; glycerin to 120. This is to be applied to the throat with a cotton swab every two hours, changing the swab each time, and diminishing the frequency of applications with the abatement of the severity of the symptoms. A second formula is: equal parts of hydrogen peroxide, sodium borate and glycerin dissolved in eight parts of rose-water, of which a tablespoonful is instilled into the nose every two hours, when membranes are present in the nares, and every four hours in their absence. Do not wait until cardiac debility appears before giving stimulants. The complete anorexia so often present is explained as a probable "provision of nature to starve the micro-organisms lodged in the alimentary canal." Nourishing food is, however, insisted on, and nutrient enemata if required. For internal medication strychnine with iron should be given. Antipyretics are rarely needed, and small doses are sufficient to relieve the pain and reduce the fever. Laryngeal diphtheria is not, as a rule, amenable to local treatment. If there be any membrane visible in the fauces the first of the above prescriptions is advised. The nose is always to be cleansed with the second solution. In severe cases intubation is early required, thus dispensing with late tracheotomy. Intubation demands the avoidance of liquids by mouth; strychnine is given hypodermatically. To reduce the swelling of the submaxillary glands, iodine ointment, with ichthyol 10 per cent., is valuable. The writer's experience with antitoxin is that it should be regularly administered in laryngeal diphtheria, though what proportion of the beneficial results obtained from it in connection with local and internal remedies is still undetermined.—*New York Medical Journal*, 1899, No. 1100, p. 954

Deaths Under Chloroform.—Dr. J. Edmunds makes a further plea for a more accurate administration of chloroform for anæsthesia, insisting that a volumetric measure of the amount inhaled should be made, and that such measure is possible with the Krohne inhaler. He cites eighty-three deaths in

England during 1899, and asserts that if these are reported two hundred must have occurred, the remainder being suppressed. Deaths from chloroform, cyanosis being present, are due to asphyxia; more or less pure air surcharged with chloroform causes spasm of the glottis, of the respiratory muscles, diaphragm, and myocardium. Patients die from asphyxia complicated by angina of the heart. If sudden death do not follow, and chloroform is continued, paralytic relaxation of the glottis follows. The glottis being paralyzed, more surcharged air enters the bronchi, and shortly the end organs of the whole system of respiratory nerves are poisoned by direct soakage. It is not so much the quantity ingested as the local surcharge with chloroform of the lungs and heart. Waller shows that 6 per cent. vapor-volume of chloroform kills a nerve. Four minims of chloroform are the equivalent of four cubic inches of chloroform vapor. This amount would saturate the entire mass of the pulmocardiac blood and myocardium. Eighteen minims of chloroform are required in the blood to induce full surgical anæsthesia. With the Krohne inhaler twenty minims are ingested in one minute. Some will be exhaled by the lungs and skin, but the ingested chloroform is probably a lethal dose by reason of the want of time for diffusion through the general system and the local surcharging of pulmocardiac blood. Therefore a much smaller ingestion of chloroform is advised, the time required for full anæsthesia being about six minutes. Perfectly safe administration can be obtained by beginning with small volumes of chloroform air for each inspiration, such as cause neither cough nor spasm. The feather indicator is recommended as an index for respiratory currents.—*The Lancet*, 1900, No. 3987, p. 227.

The Non-surgical Use of Schleich's Infiltration Anæsthesia.—Dr. Richard Bloch proposes this method: 1. For the painless application of the cautery. 2. As an anti-neuralgic in (*a*) peripheral neuralgias; (*b*) various painful peripheral affections, as bruises, and (*c*) various joint diseases. 3. In differential diagnosis between (*a*) neuralgias of peripheral, central, or reflex origin, and (*b*) simulated and real pains.—*Centralblatt für die gesammte Therapie*, 1900, Heft 2, S. 76.

The Present Aspect of Antitoxic Treatment of Diphtheria.—Dr. F. Villy recommends that the treatment be commenced as early as possible. Ten thousand units will often accomplish more given early than fifty thousand given after several days' duration of the disease. The former dose suffices for mild injections. Twenty thousand units in all are often injected. There is no evidence that such doses produce any harmful effect. A good rule is that antitoxin should be given in sufficient dose to cause a distinct reaction in twelve hours. If reaction does not follow, the dose is to be repeated once or twice until there is some apparent effect. Too much rather than too little is advised. Except in the worst infections results of injection are permanent, complete recovery being likely, though some form of paralysis may follow; anæmia and cardiac weakness persist often for months. Since antitoxin has been used suppression of urine is almost unknown. The increase in albuminuria is largely apparent rather than real, for greater care has been exercised in estimating its percentage. It is un-

common for a permanent nephritis to supervene. The albumin rapidly disappears, and no bad effects follow. Increase in the frequency of post-diphtheritic paralysis is explained by the fact that patients recover from more serious attacks of the disease than formerly, and these are the ones most subject to paralysis. Mild injections may be followed by paralysis, but it is less frequent. Statistics show that the bulk of patients suffering from paralysis are those who undergo antitoxic treatment comparatively late in the disease. Before the introduction of antitoxin this was not the case. Exceptionally, grave constitutional effects follow. They are transient, lasting but a few hours. A chill may occur with fever, and an urticarial rash appears within a short time after injection. Such phenomena occur more frequently in relapses of diphtheria, when a second injection is given several weeks after the subsidence of a primary attack. Antitoxin rashes more often occur between the tenth and fourteenth days. The eruption consists of raised circular erythematous areas, circinate forms often appearing. They are usually confined to the extensor surfaces of the knees and elbows. The eruption lasts from a few hours to several days. Occasionally it resembles measles. The diagnosis is often difficult. Desquamation sometimes follows the eruption. Pyrexia is less common; it is mild and lasts but a few hours. Joint pains are still more rare; they last a few days, and disappear without treatment. Various degrees of heat render blood serum harmless with regard to the above after-symptoms. Antitoxic serum has not as yet been prepared free from these deleterious qualities. Abscesses should never occur at the seat of injection, antiseptic precautions being observed.—*The Medical Chronicle*, 1900, vol. ii. p. 241.

GYNECOLOGY.

UNDER THE CHARGE OF

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Extirpation of the Vagina for Carcinoma.—Sippel (*Centralblatt für Gynäkologie*, 1900, No 4) describes the following operation which he performed successfully in a case in which the entire vagina was transformed into a narrow rigid tube through cancerous infiltration of its walls. An incision was made on the left side of the introitus between the anus and tuber ischii, the ischiorectal fossa being freely opened. The left lateral and posterior vaginal walls were separated by blunt dissection as high as the attachment of the levator ani, bleeding vessels being ligated. The incision was then carried around the introitus and the urethra separated. The lower end of the vagina was then clamped and drawn downward, while the rectum and urethra were protected by retractors, which separated the upper and lower edges of the wound so that the relations of the organs in the pelvis could be

easily studied, and the bladder and ureters pushed upward. The bases of the broad ligaments, with the uterine arteries, were ligated and divided; then the posterior fold of peritoneum was opened, the uterus returned, and finally the uretero-vesical fold was incised and the upper portions of the broad ligaments were ligated. The adnexa, being normal, were not disturbed. The uterus and vagina having been removed *en masse*, the stumps were brought down and sutured in the angles of the wound near the introitus, so that the lateral raw surfaces were covered with peritoneum. The anterior and posterior peritoneal edges were also attached to the introitus, and the external wound was sutured, a small opening being left, which was packed with gauze. The operation was completed in an hour, only a moderate amount of blood being lost. Recovery was afebrile. The patient was up at the end of three weeks, the wound having healed entirely, without any disturbance of the bladder or rectum.

The advantages of the procedure are the fact that the field of operation is perfectly visible and accessible, while the vagina and the cancerous tissues are excluded from contact with the wound.

Unusual Case of Elephantiasis Vulvæ.—LAUWERS (*Ibid.*) reports a case of elephantiasis in a woman, aged thirty-five years, in which the tumor had begun to develop twenty-four years before. The growth extended two handbreadths below the knees, so that locomotion was impossible except when the legs were widely abducted. The patient desired an operation so that she could marry. The pedicle covered the hypogastrium above, and the vulva and anal region below. Flaps were dissected off both sides of the pedicle, and it was divided, the hemorrhage being moderate. The raw surface was thoroughly covered and primary union resulted, except at the upper and lower angles of the wound, where drains had been inserted.

Menstruation, which had been absent for some time, returned normally.

Adenoma Malignum.—SINCLAIR (*Ibid.*) believes that neoplasm develops more slowly than carcinoma. He thinks that it is difficult to distinguish microscopically between benign and malignant adenoma, except that the glands show an irregular arrangement in the latter. Invasion of the subjacent muscular tissue by the glands is the only positive evidence of malignancy.

Adenomyoma of the Epoophoron and Paroophoron.—PICK (*Virchow's Archive*, Band clvi., Heft 3), from a study of these growths, arrives at the following conclusions: 1. From the parovarium may develop adenomyomata of the broad ligament which contain cytogenous connective tissue with glands which are identical with those of the primordial kidneys. 2. As the tumors develop and undergo histological changes the differences between those springing from the epoöphoron and paroöphoron become less marked, so that their origin cannot be positively inferred. 3. Adenomyomata, the epithelial elements of which are derived from the primordial kidneys, if they are found in the uterus, tubes, posterior vaginal fornix, or iliac region, are of parovarian origin, while those in the broad ligaments spread from the epoöphoron. 4. The glandular portions of these growths closely resemble

the uterine mucosa, and when found in the epoöphoron may simulate an accessory uterus.

Inversion of the Uterus by Tumors.—ALEXANDER (*Archiv für Gynäkologie*, Band lviii., Heft 2) distinguishes partial inversion from beginning inversion. While the size and weight of the neoplasm and the influence of the intra-abdominal pressure in a patient with relaxed abdominal walls are important factors in causing inversion, uterine contractions must be regarded as the principal cause.

Influence of Other Diseases on Cancer.—WILLIAMS (*Edinburgh Medical Journal*, 1898, No. 10), as the result of a series of several hundred observations on living and dead subjects, arrives at the conclusion that erysipelas inflammation has no retarding influence upon the development of cancer. The apparent arrest of malignant disease is due rather to the poor vitality of the patient. Syphilis is relatively a rare accompaniment of cancer, also tuberculosis in the active stage. On the other hand, the writer found at auptosies old or arrested phthisical foci three times as often in cancerous as in other subjects, so that malignant disease seemed to exercise a retarding influence on pulmonary tuberculosis.

Dilatation of the Anus in Inoperable Carcinoma.—PONCET (*Lyon Méd.*, February 19, 1899) calls attention to the favorable action of dilatation of the anal sphincter for the relief of the neuralgic pains accompanying inoperable carcinoma of the uterus and prostate. Under anæsthesia both the anus and rectum were thoroughly dilated with the finger or with specula, the relief being quite marked and persisting for some time. The operation can be repeated at intervals, since it is quite harmless.

Papillary Tumors of the Fallopian Tube.—MAIREZ (*Inaugural Diss ; Centralblatt für Gynäkologie*, 1900, No. 6) has collected reports of thirty-three cases, twenty-four being malignant, nine benign growths. They develop in cysts which form in the tube without any change in its walls. The benign form presents the ordinary type of an adenopapilloma, the malignant that of epithelioma ; the latter may be primarily cancerous or develop from a pre-existing papilloma. Papilloma of the tube follows salpingitis. The epithelial cells on the walls of the cysts undergo hyaline degeneration, and the serum fluid which results may escape into the peritoneal cavity, causing general or encysted ascites, or it may make its way into the uterus through the proximal end of the tube, leading to intermittent vaginal discharges. It is not possible to make a certain diagnosis of this condition before opening the abdomen.

Changes in the Adnexa in Cases of Uterine Fibroid.—GRECO (*Annales de Gyn. et d'Obstetrique*, 1900, No. 1) finds that the principal changes in the tube consist in hypertrophy of the mucous membrane and muscular tissue, often associated with catarrhal inflammation, rarely suppuration. Atresia of the uterine end of the tube is sometimes observed.

The ovary is usually hypertrophied and contains small cysts, sometimes

small purulent foci. Microscopically an increase in the size and number of the vessels is noted, with proliferation of the connective tissue of the stroma. The Graafian vesicles disappear, and microcystic degeneration and formation of corpora fibrosa result.

Danger of Coitus in Inflammatory Conditions of the Uterus and Adnexa.—BELIN (*Rev. Prat. d'Obstetrique et de Gynécologie*, 1899, No. 12) reports a case of pyosalpinx which ruptured in consequence of violent coitus, leading to infection of the peritoneum, the patient being saved only by an early section He believes that these cases are not rare, and insists that intercourse should be absolutely interdicted in the presence of inflammation of the uterus and adnexa.

Predictions Regarding Conceptions.—CERF (*Ibid.*) reports the case of a woman, aged fifty-three years, who had not menstruated for four years, who desired a certificate from a physician to present before a court of law that it was impossible for her to become pregnant. After a careful review of the literature of the subject, and receiving the opinions of several experts, the writer arrived at the following conclusions: 1. There is no positive sign of the menopause. 2. The menopause does not coincide exactly with the cessation of ovulation. 3. There is no certain criterion of inaptitude for conception.

Castration in Uterine Fibroids.—SCHÜLEIN (*Berliner klin. Wochenschrift*, 1899, No. 38) argues in favor of removal of the adnexa in cases of fibromyoma of the uterus, his results as regards both the cessation of hemorrhage and the disappearance of the tumor having been most satisfactory. The possibility of subsequent malignant degeneration of these growths he believes to be so rare that it may be disregarded. He mentions the following indications for the operation: 1. Interstitial tumors, which do not exceed in size the pregnant uterus at seven months. 2. Smaller growths in a patient who is so weak that a radical operation is not advisable.

Histogenesis of Uterine Fibromyomata.—RIZZUTI (*L'Indépendance Médicale*, September 20, 1899), as the result of his histological studies, believes that fibromyomata of the uterus developed from the small branches of the uterine and ovarian arteries in consequence of local irritation—in short, that they represent simply a partial hyperplasia of the uterine tissues.

Senile Endometritis.—LORAIN (*Revue méd.; Frauenarzt*, January 19, 1900) calls attention to the importance of making an exact diagnosis in this condition, since hemorrhage is a frequent symptom. The treatment consists in dilatation of the cervical canal and the application of carbolic acid, iodine, or ichthyol two or three times weekly, followed by the insertion of a strip of gauze. This will usually be successful in three or four weeks.

Painful Endometritis.—SNEGUIREFF (*Archiv für Gynäkologie*, Band lix., Heft 2), in a paper on this subject, summarizes as follows: 1. Patients with

this condition are apt to complain of general nervous symptoms rather than local, hence they are often regarded as purely neurotic. 2. This error is also due to superficial examinations and the failure to test the sensitiveness of the endometrium, the uterus being regarded as normal because it is not enlarged. 3. There is an intimate relation between the sympathetic nerves of the pelvis and the lumbar plexus, as shown by the pains on the inner aspect of the thighs in connection with painful endometritis.

Treatment of Pelvic Peritonitis.—STRATZ (*Zeitschrift für Geb. u. Gyn.*, Band xlii., Heft 1) concludes a paper on this subject as follows: Nearly all infectious diseases of the adnexa are curable, at least symptomatically, by conservative treatment, without operation. The prognosis is best in puerperal cases. In a small proportion of old gonorrhœal and tubercular cases only is operation justifiable. The writer calls attention to the fact that death rarely results from inflammation of the adnexa. In 1000 cases he has operated only twenty times. He believes that, in spite of the diminished mortality, the general disposition to remove diseased adnexa is to be reprehended.

Castration in Rudimentary Uterus.—EBERLIN (*Ibid.*) reports a case in which the operation was performed on account of severe attacks of abdominal pain. The patient, a married woman, had never menstruated, and intercourse was impossible on account of an undeveloped vagina. The uterus was absent, but the ovaries could be palpated. The latter were removed and the menstrual molimina ceased entirely. The writer has collected twenty-one cases in which the operation was performed, all but two being successful. One patient died of septic peritonitis, and the other continued to suffer from general nervous disturbances.

Appendicitis and Disease of the Adnexa.—In a discussion before the Leipzig Obstetrical Society, FIRTH (*Monatsschrift für Geb. u. Gyn.*, Band ix., Heft 2) called attention to the fact that the appendicular ovarian ligament described by Clado, instead of being constant, is the exception. He believed that the frequent occurrence of appendicitis as a complication of disease of the right tube and ovary was due simply to the tendency of the appendix to descend into the pelvis and to become adherent to the tube. In most of these cases such changes will be found to have occurred in the walls of the appendix that its removal is indicated.

SAENGER thought that it was important to inspect the appendix in all cases of inflammatory disease of the adnexa. The former might contain a pus-focus even when there were no evidences of peri-appendicitis.

ZWEIFEL raised the question whether purulent salpingitis could arise from the migration of colon-bacteria or streptococci from an adherent suppurating appendix, without actual rupture of the abscess into the tube, because it had been proved that these micro-organisms did not cause suppuration when brought in contact with the healthy tubal mucosa.

KRÖNIG thought that when appendicitis and pyosalpinx coexisted it was exceedingly difficult to discover the origin of the process.

OBSTETRICS.

UNDER THE CHARGE OF

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Malaria and Pregnancy.—In the *British Medical Journal*, 1899, No. 2000, EDMONDS contributes a paper upon the influence which malarial intoxication has upon pregnancy.

He considers it a serious matter, as fœtal life is often sacrificed and the mother is sometimes in danger. We distinguish intermittent, remittent, and cachectic malarial states as affecting the period from conception to the sixth month, and from the sixth month to the end of the puerperal period. The simple intermittent has no effect upon conception, and if mild, none upon the mother's or the child's life. As an illustration of this he cites the case of a young girl who had had a slight intermittent malaria for six months, and who, during this time, became pregnant. If, however, the intermittent is acute, and the temperature rises above 104°, abortion usually takes place. In cases of pregnancy complicated by acute intermittent malaria the uterus is hard and firmly contracted, but if quinine be given promptly and the temperature does not rise above 104°, the mother and child may be saved.

The bilious remittent malarial fever has the same effect on pregnancy which the simple has, but differs in degree, the fever being higher, abortion more common, and hemorrhage being pronounced. Here, again, if the case be taken early, treatment may be successful. He describes the case of a young girl who had had fever for nine months, and who was very cachectic. Under appropriate remedies she recovered and became in very good condition.

During the second period of pregnancy the complication of malaria gives rise to much more acute and dangerous conditions. The fœtal movements become strong and cause severe pain, uterine cramp is severe, and very often a dead child is expelled, its epidermis peeling and appearing mottled, and the placenta of a heavy, dull color.

When bilious malarial fever complicates, the second period of pregnancy grave danger arises. The reaction of the fœtus at first is marked, but becomes weaker and fades away. The contraction of the uterus is not so firm, but is painful, and there is much soreness and tenderness over the abdomen. The patient aborts or miscarries, but often fails to expel the child and its appendages completely. There may be severe hemorrhage after expulsion of the child, with progressive weakness, black stools, and death from exhaustion within ten days after labor. The child may be strong and healthy.

When a pregnant patient has the cachexia of malaria the pregnancy is influenced very much as in any other cachectic condition. The stomach refuses to

take nourishment, labor is slow and lingering, and operative interference is often imperative. The child may not be affected.

The writer considers malarial fever responsible for a large number of still-births. During the hot stage the uterus contracts strongly, and the fœtus is subjected to great pressure. This usually causes its death, and the dead child is expelled a few hours after the active stage. No hesitation need be felt in giving quinine in large doses to prevent this accident. Pregnant patients during the early months often take 10 and 15-grain doses of quinine without interrupting the pregnancy.

Tubal Pains.—In the *Centralblatt für Gynäkologie*, 1899, No. 19, THORN calls attention to the intense suffering which some patients experience in tubal gestation. These cramps are so severe as greatly to exceed the most trying pains of ordinary labor. Thorn had a case in which this symptom of cramp was very prominent, and upon which he operated. He found tubal pregnancy in process of abortion. The ovum was partly expelled from the tube and the tube was partly inverted and constricted.

Thorn's case well describes the probable cause for these very severe cramps.

The Treatment of Cancer of the Cervix in Pregnant Patients.—In the *Monatsschrift für Geburtshülfe und Gynäkologie*, Band ix., Heft 1, 1899, MERTENS discusses this subject, reviewing its literature, and adding an interesting case of his own.

His patient was forty-five years old, had been previously healthy, and had borne nine children. During the present pregnancy she was well until a sudden hemorrhage occurred. This ceased when she resumed a recumbent posture.

On examination, the patient was about thirty-six weeks advanced, and upon the posterior lip of the uterus was a nodule of cancer about the size of a hen's egg. The cervix was infiltrated through a considerable part of its extent, but the surrounding tissue seemed to be free.

As the patient was so near term, the child being wholly viable, labor was induced. The child and appendages were easily delivered spontaneously. Eight days after the birth of the infant the uterus was removed by vaginal hysterectomy. The patient made an uninterrupted recovery.

[The removal of the cancerous uterus during pregnancy is best accomplished by vaginal hysterectomy at the two extremes of pregnancy: during the early months, when the tumor is sufficiently small to be removed without difficulty, and near the end of pregnancy, when the child has been removed, and the recently emptied womb may also be delivered through the vagina. Before the child is viable and after the first months of pregnancy, the majority of operators prefer to open the abdomen and to remove the entire uterus unopened. Infection seems to be best avoided by this method, and the results have been good.]

The Induction of Labor.—HEYMANN, assistant in Mermann's clinic at Manheim, contributes a very interesting paper upon the methods and indications for the induction of labor. He bases his conclusions upon 107 cases,

and has subjected these cases to careful analysis and study. While his paper must be read to be appreciated fully, his conclusions are available and are worthy of note.

The objection is often urged against the induction of labor that it has a considerable mortality both for the mother and child. So far as the analyses of his cases are concerned, he has found no mortality following the induction of labor from any cause which is not in some cases operative in normal labor. He feels justified in concluding that the induction of labor by the introduction of aseptic bougies has in itself for the mother no mortality directly resulting from this procedure. He believes that the use of bougies is the best method in all cases; that it is uniformly successful, provided the physician realizes that induced labor is a gradual process. It must not be expected that birth will proceed as rapidly as in many normal cases, and if this fact be taken into account the method is entirely satisfactory. Its simplicity is its chief merit, and from this results its harmlessness.

In disproportion between the child and the mother, the best time for the induction of labor is from the thirty-third to the thirty-fifth week, when its results are better than those of any other method of delivery for both mother and child. Among children so born 64.3 per cent. survived in good condition. Cæsarean section gives a better result for the children, but at a much greater risk to the mother.

In comparing Cæsarean section with induced labor, it must be remembered that the brilliant results of the former are obtained by skilled operators in good hospitals, while the induction of labor is possible to persons of average skill and without hospital advantages.

Care must be taken that the induction of labor be not practised when the pelvis is too small. An internal conjugate of 7 cm. (two and three-quarter inches) is the lowest measurement at which the induction of labor can be expected to be successful.

Before the thirty-fifth week of gestation the chance of survival for the child is not good, while after the thirty-fifth week, if the child has good care, its chance is as good as at full term.

The induction of labor gives brilliant results in cases in which the pregnant woman is attacked by some disease which threatens to end her life. Its field may be extended also to those conditions which cause the mother during pregnancy great suffering, and render the continuance of the pregnancy a serious matter—for example, when the mother's respiration is greatly interfered with by polyhydramnios and the presence of twins, and when severe abdominal pains occur. These latter cases often result from endometritis. In these cases complicated by hemorrhage the induction of labor is also indicated. In fevers occurring during pregnancy it may be necessary to end the pregnancy, and thus remove a serious complication. In retroversion and retroflexed uteri which cannot be replaced, in molar pregnancy, and in pernicious nausea and vomiting, the induction of labor is often of the greatest value.

Under favorable conditions eclampsia during pregnancy should be treated by the induction of labor, but the cases must be carefully selected.

The writer lays especial stress upon the positive indication for induced labor found in nephritis, valvular heart lesions, and tubercular infection. In

the presence of these conditions pregnancy in his opinion should be terminated. He would interfere early rather than late in these cases.

While fully recognizing the value of Cæsarean section and symphysiotomy, under favorable conditions he believes that induced labor has a valuable field, the limits of which by our accumulated experience can now be well defined.

DERMATOLOGY.

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Interdigital Hyperkeratosic Eczema. –DUBREUILH (*Annales de Dermatologie et de Syphiligraphie*, 1899, No. 12), under the above title, reports four cases of an affection hitherto undescribed. The parts affected were almost exclusively the spaces between the toes; in only a single instance were similar lesions found between the fingers. The surfaces of the toes in contact were covered with a shining, white, almost blue, thick corneous layer, which came away in strips, first loosening at the edges while firmly attached in the centre. Beneath this corneous layer the skin was a deep red. This desquamation was incessantly reproduced, and was not accompanied by much pain or itching. There were occasionally subacute attacks of vesicular eczema upon the dorsal surface of the toes. Hyperkeratosis was a frequent accompaniment of the disease. Treatment was unsatisfactory, but an alcoholic solution of ichthyol produced decided improvement.

Treatment of Ulcers of the Leg by the Products of the Bacillus Pyocyaneus.—BUKOVSKY (*Annales de Dermatologie et de Syphiligraphie*, 1899, No. 12), who treated one hundred cases of ulcer of the leg with the products of the bacillus pyocyaneus, obtained a definite cure in a short time without having had to employ any auxiliary remedies, even in cases which had proved rebellious to other forms of treatment. Compresses impregnated with the toxin were applied to the ulcers and were renewed two or three times a day. The toxin had no effect upon the patient's general condition and produced no subjective local symptoms; nor was the neighboring epidermis, whether normal or pathological, affected. It had no unfavorable effect upon the granulations. Its action upon the ulcer was manifested by rapid cleansing when there were no complications; if eczema, varices, cicatrices, or elephantiasis were present this took place a little more slowly. It favorably affected epidermization, and produced solid cicatrization more rapidly than any other topical application.

Lupus Erythematosus and Tuberculosis.—ROTH (*Archiv für Dermatologie und Syphilis*, Band li., Heft 1), after a careful study of many published cases of lupus erythematosus, concludes that this affection must be regarded as of undoubtedly tuberculous origin, being produced by the toxins of tuberculosis, which, perhaps, have been modified by unknown biological factors or have undergone some attenuation. The acceptance, however, of certain predisposing, partly local, partly general, conditions of the body of the patient is necessary for the explanation of the process.

Imperfect or Deficient Urinary Excretion as Observed in Connection with Certain Diseases of the Skin.—BULKLEY (*Journal of Cutaneous and Genito-urinary Diseases*, March, 1900) presents a study of 2000 analyses of the urine of patients suffering from various diseases of the skin. In 316 cases of eczema there were very few specimens of urine which did not show gross and radical departures from the normal. In acne the analyses showed abundant evidence of disturbed assimilation. In psoriasis the acidity was high, and oxalate of lime was frequently seen. The urea was a little above the normal. Upon the whole, however, the results of the analyses were somewhat disappointing as to positive facts connected with the condition of the urine in diseases of the skin.

The Histogenesis of Melanosarcoma of the Skin.—SCHALEK (*Journal of Cutaneous and Genito-urinary Diseases*, April, 1900), having studied five cases of melanosarcoma, concludes as follows concerning the origin of this neoplasm: Melanosarcoma of the skin arises from pigmented cells of the epidermis, these cells proliferating into the connective tissue and becoming entirely detached from the epidermis. Continuing to proliferate, these cells lose their epithelial character and assume that of ordinary connective tissue cells and that of those pigmented cells known as chromatophores. The author believes the view held by Unna and his followers is probably correct.

Tobacco Soap as a Parasiticide.—MARCUSE (*Therap. Monatsheft.*, 1899, No. 12) has found soap containing tobacco a useful remedy in a number of parasitic and other affections of the skin. He has successfully treated 32 cases of scabies, 6 cases of tinea versicolor, 4 cases of tinea tonsurans, and a few cases of urticaria and prurigo with such soap. The method is to be recommended on account of its cleanliness and cheapness.

Meningitic Herpes.—EVANS (*British Journal of Dermatology*, March, 1900) calls attention to the fact that a considerable number of cases of herpetic eruption have their starting-point in a meningitis—a fact of importance, both from a diagnostic and prognostic point of view. Herpes zoster may occur in epidemic cerebro-spinal meningitis, being one of the more common cutaneous manifestations observed in this disease. Herpes may occur in tuberculous meningitis, but it is decidedly rare in this form. It is noticed more frequently in the non-tuberculous basal meningitis of children, being usually bilateral, affecting the branches of the fifth nerve. It occurs in meningitis from extension of disease of the middle ear, usually over some branch of the fifth pair. The characteristics of herpes zoster accompanying

meningitis are as follows: A very great tendency to be bilateral, especially noticeable in epidemic cerebro-spinal meningitis and the non-tuberculous basal form of children; greater persistence than the usual form; and, lastly, correspondence of the eruption with the distribution of the nerve-root and not with the distribution of the nerve, except when these are practically identical, as in the dorsal region of the cord.

The Blood in Xeroderma Pigmentosum.—OKAMURA (*Archiv für Dermatologie und Syphilis*, Band li., Heft 1), who examined the blood in three cases of xeroderma pigmentosum observed in Prof. Kaposi's clinic, found in all three cases an oligocythæmia associated with a tolerably well-marked leucocytosis. In the absence of other discoverable cause, the author believes these changes in the blood are due to the interference with the functions of the skin. This exerts a prejudicial influence upon the entire organism and disturbs the functions of the blood-making organs. In two of the cases the eosinophilous cells were increased; in the third they were diminished.

Formalin in Hyperidrosis Pedum.—ADLER (*Deutsche med. Wochenschr., Therapeut. Beilage*, No. 10) prefers formalin before all other remedies in the treatment of hyperidrosis. Although the treatment has to be repeated from time to time, this is a disadvantage belonging to all remedies. The formalin may be painted on with a brush. When rhagades exist between the toes these should be healed before using the formalin, the author employing tannoform for this purpose.

Eugallol in the Treatment of Psoriasis.—GOLDSCHMIDT (*Dermatologisches Centralblatt*, iii., 1; *Journal of the American Medical Association*, April 7, 1900) has employed eugallol in the treatment of a number of cases of inveterate psoriasis. A solution made with acetone was painted daily for several days upon the affected parts, and was followed in from fifteen to thirty minutes by the application of a zinc paste. The black discoloration which it produces is an objection to its use on the face; but this discoloration only lasts a few days, and may be partially removed by means of ether. Some of the conclusions based upon the results obtained are as follows: Eugallol, used as above described, exerts an extremely rapid and energetic action on psoriatic efflorescence in every stage. In very extensive eruptions this method is too tedious and difficult of application to be employed; but it is excellently adapted for isolated inveterate plaques that are resistant to all other treatment. Toxic effects are never observed, even after the most extended use, or are very unimportant. In some cases it produces slight local irritation, which, however, rapidly disappears when its use is suspended.

Herpes Zoster Due to Arsenic.—BETTMANN (*Archiv für Dermatologie und Syphilis*, Band li., Heft 2) reports the case of a woman, aged fifty years, who, after the administration of arsenic by the mouth and subcutaneously for a malignant lymphoma, developed a gangrenous ophthalmic zoster, a diffuse and generalized vesicular eruption, and palmar and plantar hyperkeratosis. All these cutaneous manifestations, the author believes, were due to the arsenic taken; and the case is reported as affording proof that there actually is an arsenical zoster.

HYGIENE AND PUBLIC HEALTH.

UNDER THE CHARGE OF

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Disinfection by Steam.—Owing to the fact that observations at one of the United States Quarantine Stations had shown that steam introduced into cylinders under pressure, but without continuous outlet, left "dead spaces" of less than 212° F., and penetrated pillows, mattresses, etc., very slowly, DR. H. R. CARTER, U. S. M. H. S. (*Public Health Reports*, April 27, 1900), attempted to remedy the defects by turning on a considerable head of steam and allowing it to escape freely. He found that articles penetrated slowly by still steam were penetrated rapidly by flowing steam. Wads of cotton quilts were the most difficult to penetrate, and feather pillows the next; mattresses and blankets under any condition of roll or wad were penetrated very readily. The preliminary use of a vacuum was found to hasten penetration materially and to offer very considerable advantages when it is desirable to lay fabrics flat or to pack a large amount of clothing in the chamber at one time. When the articles are very closely packed a second and even a third vacuum followed by steam under pressure may be used to insure greater penetration; but, as a rule, close packing results in getting the fabrics out in too wet a condition for immediate removal, so that no time is gained, even though the drying vacuum is employed. When they are loosely packed they dry as well, or nearly so, with flowing steam as when the drying vacuum is used. With plenty of room for a large chamber, and when the articles handled are chiefly seamen's clothes and bedding, the method with flowing steam is probably the best, since little skill is needed, and each owner unpacks and repacks his baggage; but for passenger work, when room is scarce and the work heavy, the vacuum offers very great advantages, and with care gives far better results.

Elimination of Bacteria Through the Mammary Gland.—The contention of Basenau, that under ordinary conditions the mammary glands are not an exit for bacteria circulating in the blood, but that in severe or long-continued sickness they may throw them out, is supported by the conclusions of BASCH and WELEMINSKY (*Archiv für Hygiene*, vol. XXXV., p. 205), who experimented with a number of varieties of bacteria. They found that the milk of guinea-pigs infected with the organisms of typhoid fever, cholera, diphtheria, and anthrax was quite free from them, but that in local affections of the mammary glands B. pyocyaneus and B. bovis morbificans were found with regularity. With simultaneous infection by B. bovis morbificans and B. anthracis the latter were also found.

That the milk of a tuberculous mother may be a source of infection for her child is shown by a case recorded by ROGER and GARNIER (*Comptes Rendus de la Société de Biologie*, March 2, 1900, vol. lii.). Four days after her confinement two guinea-pigs were inoculated with her milk; one died of tuberculosis, but the other, which received a smaller dose, showed no ill effects. Seventeen days after delivery the woman died with advanced pulmonary tuberculosis. Her child lost weight from birth and died when six months old. Tubercular lesions of the mesenteric glands, liver, spleen, and kidneys were found, and in them the presence of the specific bacilli was demonstrated.

Preservative Action of Common Salt.—According to A. PETTERSON (*Archiv. für Hygiene*, vol. xxxvii. p. 171) common salt does not exhibit the same degree of inhibitory action with all forms of bacteria, those which attack albumin most vigorously being the most easily affected, and bacilli in general being much more sensitive than cocci. When its proportion in the raw material exceeds 5 per cent. the growth of obligate anaërobes is inhibited, and only aërobes and facultative anaërobes are to be found. The growth of bacilli as a class is inhibited by 10 per cent., but a few species will withstand 12 per cent., and in pure bouillon cultures even 15 per cent. Cocci as a class grow very well in the presence of 15 per cent., and so does a certain yeast observed in preparations of meat and fish. The chief factors in the activity of salt as a preservative are general retardation of growth of organisms and inhibition of those which decompose albumin. When fish are preserved with the smallest amount of salt necessary to prevent putrefactive changes, extensive growth of organisms which do not induce putrefaction is not prevented, and these may bring about desirable changes in appearance, smell, and taste.

A New Method for the Determination of Fat in Milk. A simple and accurate method for determining the percentage of fat in milk is offered by BONNEMA (*Chemiker-Zeitung*, 1899, p. 541). In a cylinder of sufficient capacity 10 c.c. of milk and 1.5 c.c. of a 20 per cent. solution of caustic potash are shaken together, and then 25 c.c. of ether are added and the whole shaken for five minutes, after which the vessels and contents are allowed to stand for a while in cold water. Next are added 2 grammes of gum tragacanth, which on thorough shaking takes up all the water, leaving the supernatant ether in a clear state. Ten c.c. of the ether are evaporated in a weighed dish, and the weight of the residue, which represents the fat of 4 c.c. of milk, is noted. This multiplied by 25 gives the percentage of fat in the sample.

"Smoke Color" for Sausages.—Several samples of a "smoke color" recommended as a perfectly harmless preparation for use in the manufacture of Frankfurt and other forms of sausage have been examined by JUCHENACK and SENDTNER (*Zeitschrift für Untersuchung der Nährungs und Genussmittel*, 1899, p. 417), who report that they consist of Orange II., the sodium salt of azo-β-naphthol-sulfanilic acid. As much as can be taken up on the point of a knife is dissolved in about 20 litres of water, and the solu-

tion is then used cold or at the boiling-point, according to the kind of sausage. In the proper dilution it imparts a fine reddish-brown color to the casing and makes the sausage appear as if the whole of its substance had been smoked, when such is not the case. Animal experimentation demonstrated the harmlessness of the agent.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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On Areas of Large Cells in the Lymph-nodules of the Spleen in Diphtheria and Other Affections—TATIANA WASCHKEWITSCH notes that (*Virchow's Archiv*, 1900, vol. clix., p. 137) Bizzozero called attention to the occurrence of areas of large epithelioid cells in the lymph-nodules of the spleen, intestine, and mesenteric lymph-nodes in cases of diphtheria as early as 1876, but his observations have been generally overlooked. He described the cells as round, oval, or polyhedral in shape, sometimes as much as 30 mikra in diameter, and as containing each an oval, pale nucleus, in which was a distinct nucleolus. In the protoplasm he found in addition to numerous albuminous granules, two to ten small bodies, a few of the size of the nuclei of lymphoid cells, but many smaller. They are glistening, homogeneous, and stain with carmine; he considered them to be the nuclei and nuclear fragments of lymphoid cells which had been taken up and destroyed by the large cells. In the centres of the areas of cells he found only nuclear detritus. This description gives the essential facts about these areas of large cells: Improved technique has added but little. They have been described more recently by Barbacci and others, and are mentioned briefly in the text-books of Ziegler and Ribbert.

Waschkewitsch examined the spleen in 200 cases of diphtheria and other diseases, and concludes that Bizzozero described the later stages of the process. The following is a brief summary of the cell changes as described by the writer:

In the early stages the cells have a decidedly epithelioid character; they are large and round or polyhedral; they are more or less spherical, not flattened; they are separated from each other by clefts in which no evidence of cell processes can be found. There is also no sign between the cells of the normal reticulum of the lymph-nodule. The protoplasm of the cells is finely granular or homogeneous; the nucleus is vesicular, stains lightly, is oval in shape, and measures three to five times the diameter of a lymphoid cell. Each nucleus contains a distinct nucleolus. The cells usually contain but one nucleus, rarely two.

The cells frequently contain light yellowish-red pigment granules, which give the iron reaction; evidently the pigment is derived from hæmoglobin.

Between these large epithelioid cells there occur lymphoid cells, and rarely cells with long, narrow, vesicular nuclei, resembling the nuclei of the normal reticulum.

The areas of epithelioid cells described above undergo degenerative changes. The nuclei are most affected; the chromatin granules and the nucleolus collect on the inside of the nuclear membrane, leaving the centre colorless. The nucleus loses its oval shape and becomes folded; it is kidney-shaped or in marked degrees is irregularly jagged; the nuclear membrane is crumpled.

The protoplasm of the cells also shows degenerative changes; vacuoles appear, and the cells may swell so much as to measure 100 mikra in diameter. The most important change is that the cells fuse together, so that they form a coarse network. The writer believes that these large epithelioid cells are leucocytes which have wandered into the lymph-nodules.

The areas of large cells were found in 21 out of 24 cases of diphtheria, and in 11 out of 170 cases of other diseases. They occur chiefly in children, and are supposed to be due to the effect of toxins.

[The writer makes no mention of observing the cell inclusions so often found in great numbers within these epithelioid cells; does not state which one of the leucocytes in the blood he believes to wander into the lymph-nodules to form the areas of large cells; and, finally, does not show that the leucocyte, probably the polynuclear, which he thinks wanders in, is ever phagocytic for other cells.]

The Histology of Acute Lobar Pneumonia.—PRATT (*Welch's Festschrift*, 1900) gives the results of a histological study of fifty cases of acute lobar pneumonia. The tissues were hardened in Zenker's fluid, embedded in paraffin, and the sections stained with eosin, followed by Unna's alkaline methylene-blue solution.

In the early stages of the disease the alveoli contained many cells almost identical in appearance with the so-called "transitional cell" of the blood. They were usually slightly larger than the polynuclear leucocyte, the nucleus was irregular in shape and vesicular, and the protoplasm contained either a few granules or was homogeneous. In a case in which death occurred eleven hours after onset there were many of these cells in the exudate and no polynuclear leucocytes.

The origin of these cells is uncertain, but probably they arise from proliferation of the epithelial cells lining the alveoli, as many mitotic figures were found. They may be transitional cells which have emigrated from the bloodvessels, but no evidence of emigration can be found. Similar cells occurred in the lymphatics and in the pleural exudate.

After the first forty-eight hours the predominating cell in the exudate was the polynuclear leucocyte. It is phagocytic for bacteria, but not for other cells.

Large phagocytic cells were found in the exudation in all stages of the disease, but in greatest number in gray hepatization. They probably are the cells mentioned above as derived from the alveolar epithelium. A

proof of this is the fact that the cells while still attached to the walls of the alveoli are phagocytic. The inclusions in these cells are chiefly polynuclear leucocytes and lymphocytes, more rarely red blood-globules. Similar phagocytic cells occur in the lymphatics, in the pleural exudate, and in the bronchial lymph-nodes. In the pleural cavity they are derived from the lining epithelium; in the lymphatics and lymph-nodes from the endothelium.

The fibrin in the exudation usually is more abundant in the peripheries of the alveoli than in the centres. Strands of fibrin and even bundles of fibrin threads often pass directly through the alveolar wall from one alveolus to another.

Thrombi were noted in one-half the cases; usually only small vessels and capillaries were affected. Fibrinous thrombi predominated. Emboli composed of giant cells from the bone-marrow were found frequently.

The lymphatics were involved late in the disease; there was proliferation of their endothelium, and they became distended with cells, serum, and fibrin.

In cases dying during the second week there was often a great infiltration of the interstitial tissue with lymphoid and plasma cells. As a rule, the longer the duration of the disease the greater the number of plasma cells.

The Transplantation of Ovaries into Male Animals.—SCHULTZ (*Centralbl. f. allg. Path.*, vol. xi., p. 200) experimented upon guinea-pigs. The ovaries were transplanted upon the peritoneal wall in males. Ovaries were also transplanted upon the castrated female and upon normal females in the same manner. He finds that the germinal epithelium, the tunica albuginea, and the primordial follicles are preserved for at least four months in the males. These were the oldest cases examined. The follicles are smaller than in the females. The ovaries in general, however, are very similar to those transplanted upon the castrated females. In the females corpora lutea were found, but none were found in the males. He thus leaves undecided the question as to whether ova are shed from the ovaries in the male. His results are essentially the same as those obtained by Ribbert.

An Investigation of Striated Muscle, with Special Reference to Fatty Infiltration.—WALBAUM (*Virchow's Archiv*, vol. clviii., p. 170) concludes that fatty infiltration of striated muscle is common, while fatty degeneration is seldom met with. He has made an extensive survey of the literature. Personally he examined 119 cases. Fresh specimens teased out in tap-water gave the best results.

In cases of rhachitis no characteristic changes were found. Where the extremities were deformed no differences between flexors and extensors that might explain the deformity were present.

Changes in the number and character of the nuclei seemed unimportant. The fat droplets occur in longitudinal rows, the size of the droplets being determined by the width of the cross striations. In the levator palpebræ muscles the widest cross striations and the largest fat droplets were present. The amount of infiltration bore no apparent relation to the state of nutrition, the duration of the disease, or to the temperature-curve. Where fat was present no etiological factor could be discovered.

The muscles of the extremities, of the thorax, of the diaphragm, and of the eye were examined. In the order of frequency of involvement the levator palpebræ muscles came first, then followed the other eye-muscles and the remaining muscles. There was no striking relation between the age of the subject and the amount of infiltration except that in cases under one year there was very little involvement.

Together with the presence of fat there was no change in function, no decrease in size or degeneration of the fibres, no nuclear and no interstitial changes.

For these reasons he considers it an infiltration rather than a degeneration. As a general rule, the most active muscles contained most fat. He believes the fat is stored up in the muscle-fibres. Fatty degeneration was rare, and no etiology for it could be discovered.

On the Changes in Bloodvessels in Syphilis.—Abramow (*Ziegler's Beiträge*, 1899, Band xxvi. p. 202) has studied the arterial changes in two cases of syphilis, in one of which no positive history was obtained.

Contrary to the usual course, the arterial lesions were confined mostly to the extremities and internal organs, while the vessels of the central nervous system were relatively very little affected.

His conclusions are as follows:

1. All three coats may suffer independently, the intima by proliferation of its endothelium, the adventitia by cellular infiltration, and the media by granular degeneration.

2. When intima and adventitia are both affected they may penetrate the media and unite. No new elastic membrane (membrana fenestrata) is formed, and the rupture in the wall is filled with connective tissue, without any elastic tissue. This may easily lead to aneurism formation.

3. The proliferative process in the intima may cease. In such cases the membrana fenestrata becomes very thick, then splits into many elastic fibres which penetrate and fill the newly-formed tissue of the intima.

4. Only that arteritis is specifically syphilitic in which gummatous new formations are present. The presence of regressive changes in the new formation of the intima does not militate against the specific character of the lesion.

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CONTENTS.

ORIGINAL COMMUNICATIONS.

PAGE

Clinical Notes of Cases of Pernicious Anæmia. By FREDERICK P. HENRY, M.D. . 125
Pernicious Anæmia: A Study of One Hundred and Ten Cases. By RICHARD C. CABOT, M.D. 139
Experimental Research Showing that Uric Acid Secretion is not Regularly Diminished in the Period Preceding Epileptic Seizures. By JAMES J. PUTNAM, M.D., and FRANZ PFAFF, M.D. 149
Minor Forms of Cardiac Dilatation. By BEVERLEY ROBINSON, M.D. 152
Endothelioma of the Skin Developing in the Scar-tissue of Lupus Vulgaris; Angiosarcoma of the Skin. By J. A. FORDYCE, M.D. 159
A Comparative Study of Digitalis and its Derivatives. By JOHN P. ARNOLD, Ph.G., M.D., and HORATIO C. WOOD, JR., M.D. 165
Multilocular Cystoma of the Pancreas. By REGINALD H. FITZ, M.D. 184
A Critical Summary of the Literature on the Inoculability of Carcinoma. By JOSEPH SAILER, M.D. 190

REVIEWS.

On Neuroma and Neuro-fibromatosis. By Alexis Thomson 203
Contributions from the William Pepper Laboratory of Clinical Medicine . . 205
Synopsis of Toxicology. Clinical and Medical Legal. By Dr. Vibert . . . 207
Diseases of the Nose and Throat. By J. Price-Brown, M.D., L.R.C.P.E. . . 208
The Year-Book of the Nose, Throat and Ear 209
Bacteria: Especially as They are Related to the Economy of Nature, to Industrial Processes and to the Public Health By George Newman, M.D., F.R.S., etc. 209
Gynecology: A Manual for Students and Practitioners. By Montgomery A. Crockett, M.D. Edited by B. B. Gallaudet, M.D. 210

PROGRESS OF MEDICAL SCIENCE.

MEDICINE.

PAGE

Cultivation of Typhoid Bacilli from Rose-spots 211
Concentration of Urine and Blood in Kidney Diseases; Cause of Uræmia 212
Venous Thrombosis as a Complication of Cardiac Disease . . . 213
An Analysis of Sandy Matter from the Human Intestine 215
A Case of Typhoid Infection without Intestinal Lesions 216
Etiology of Head-shaking with Nystagmus (Spasmus Nutans) in Infants 217

SURGERY.

A Contribution to the Surgery of Perforated Gastric Ulcer . . . 218
Perforating Duodenal Ulcer . . 220
Local Anæsthesia in the Radical Cure of Certain Cases of Hernia . . 221
The Effects of Mechanical Action on Bone Growth 223
Traumatic Diastases 224
When Shall We Operate in Cholelithiasis? 224

PEDIATRICS.

	PAGE		PAGE
Pulmonary Affections Consecutive to Infectious Diseases	225	Treatment of Chronic Constipation in Childhood	227
Extract of the Suprarenal Capsules in the Treatment of Rhachitis	226	Elimination by the Urine of Sugars Introduced Subcutaneously	227
Parotitis, with Involvement of the Submaxillary Glands	227	Serous Meningitis and Seropurulent Meningitis due to Streptococci	228

THERAPEUTICS.

Atmokausis	229	Treatment of Pleurisy	232
Soluble Silver	229	Diabetes Mellitus of Apparent Bacterial Origin Successfully Treated	233
Treatment of Scarlet Fever Nephritis	230	Serum Treatment of Diphtheria	233
Asthma and its Treatment	230	Typhoid Fever in Children Treated by Cold Baths	235
Kryofin	230	Benefits of Balneotherapy in Chronic Rheumatism and Gout	235
Untoward Symptoms from Pyramidon	230	The Use of Guaiacol in Malaria	236
Mercurial Neuritis	231		
Creolin in Eczema, Psoriasis, and other Diseases of the Skin	231		
The Treatment of Obesity	231		

GYNECOLOGY.

Œdema of the Bladder due to Stricture	237	Results of Castration	238
Abnormal Openings of the Ureters	237	Pyosalpinx with Vaginal Atresia	239
Treatment of Incontinence of Urine	238	Prevention of Conception	239
Angiotrypsy	238	Mortality after Cœliotomy for Tubercular Ascites	239

OBSTETRICS.

The Pathology and Symptoms of Degeneration of the Chorion	240	Peritonitis Complicating Pregnancy	241
		Fibromyomata and Pregnancy	242

OPHTHALMOLOGY.

Iodic-acid Solutions for Trachoma	243	Treatment of Corneal Ulcers by Electrolysis	245
Iodine Solutions for Trachoma	243	The Analgesic and Therapeutic Value of Dionin	245
Ocular Lesions of Typhoid Fever	243		
Visual Disturbances in Acromegaly	244		
Hereditary Optic Atrophy	244		

OTOLOGY.

Vibratory Pneumomassage of the External Ear in Chronic Deafness	246	Cerebral Abscess following Influenza Otitis	247
Acute Bi cameral Brain Abscess after Opening the Mastoid; Recovery	246	Unilateral Paralysis of Cerebral Nerves Produced by a Tumor	247

HYGIENE AND PUBLIC HEALTH.

Diseases due to Ingestion of Oysters and other Mollusks, and their Prevention . 247